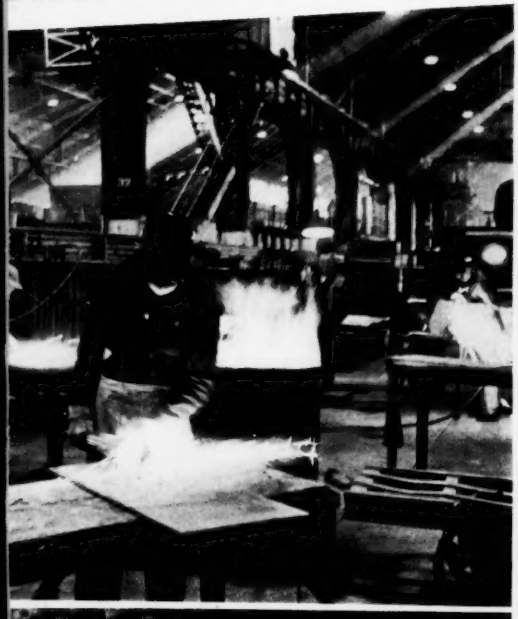
Chemical Week

April 13, 1957

Price 35 cents

Where do we stand on titanium equipment? . . p. 27



A McGRAW-HILL PUB

A superb French High Renaissance design of the late 16th Century. Fine furniture and fine finishes have been prized down through the ages.

For the finest in finishes . . . use ketone solvent systems

Solvent systems based on ketones produce superior finishes, at no increase in production cost and in almost any formulation.

Important, too—ketones yield solutions of higher solids, or permit greater diluent content with either aromatic or aliphatic solvents.

Still another advantage—ketone-based solvent systems assure complete flexibility in formulating. When you buy Shell high-purity solvents, *you* add the latent solvents *you* prefer.

The Shell Chemical "Quality Group" of active solvents includes Acetone, MEK, MIBK, EAK, and DAA, as well as latent solvents MIBC, IPA and Industrial Ethyl Alcohols. Your Shell Chemical representative will gladly discuss with you the advantages of ketones in your own lacquer formulations.

SHELL CHEMICAL CORPORATION

CHEMICAL SALES DIVISION, 380 Madison Avenue, New York 17, New York

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SHELL

Footwear manufactured by the Tyer Rubber Company, Inc., Andover, Massachusetts

It frees the foot—and the fancy

A big step forward in product improvement was recently taken by a leading maker of canvas shoes, when he started using PLIOFLEX rubber in his top lines. For with PLIOFLEX he literally made his customers more foot-loose and fancy-free by greatly improving both performance and appearance.

The major advantage of using PLIOFLEX lay in its replacement of a starch-based compound to permit combining (adhering of the rubber to the canvas) which insured breathability and full washability. It also assured full flexibility and a long-wearing, light-colored sole for comfortable, unrestrained use without danger of marking any surface.

To capture the customer's fancy, PLIOFLEX also permitted the use of a range of clear, bright, light colors. Further eye appeal was added by its ability to hold embossed designs on the foxing, outsoles and other trims. And as if all this wasn't enough, PLIOFLEX also lowered costs.

If your product uses styrene rubber in any form, be sure you have the full story on PLIOFLEX. There's a type of PLIOFLEX to meet every property cost requirement and to do it easily and economically. For details plus the latest *Tech Book Bulletins,* write to: Goodyear, Chemical Division, Dept. D-9417, Akron 16, Ohio.

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DIVISION

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Chemigum, Plioflex, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

CHEMIGUM • PLIOFLEX • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS

High Polymer Resins, Rubbers, Latices and Related Chemicals for the Process Industries

Chemical Week

Vol. 80, No. 15

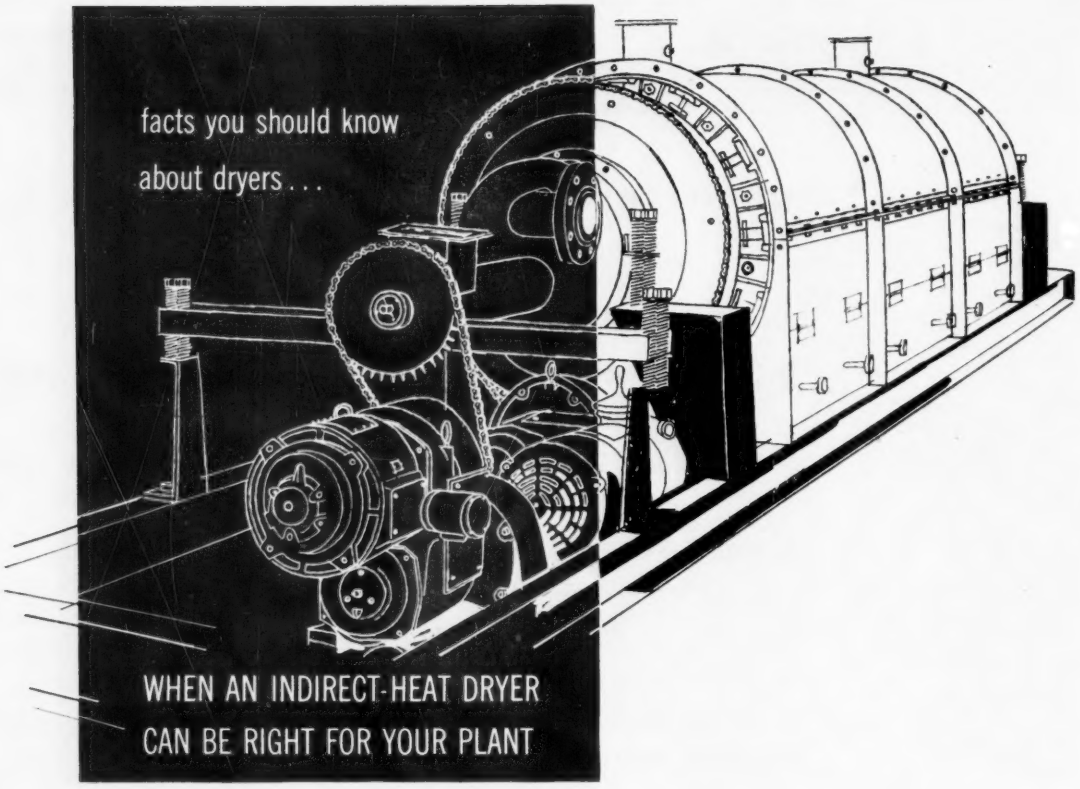
TOP OF THE WEEK

April 13, 1957

▶ **Hooker Electrochemical sees no long-range power problems** rising out of current difficulties at Niagara Falls .....p. 22

▶ **Here's the key to Cosden's low-investment styrene process:** use of 200-ft.-tall fractionating columns .....p. 36

▶ **Four new chemical trademarks are being introduced.** The reason: companies are seeking better public identification for their products .....p. 108



For over 55 years, Louisville Dryers have been solving industry's drying problems and effecting marked economies. The records of this experience can often be applied to specific cases, possibly yours. For example . . .

Q. *My material is a filter cake, practically all minus 325 mesh, and must not contact furnace gases. It can be heated to 500° F. at least, without injury. What type of dryer would do the job best?*

A. You might consider using a direct-heat rotary dryer that utilizes clean, heated air as the drying medium—air heated by steam coils or a gas or oil fired heat exchanger. However, this introduces a considerable dust collection problem. Besides, from a standpoint of capacity, it is inefficient as well as from a heat-cost standpoint. This makes it unduly expensive. Therefore, a type of indirect-heat rotary dryer is indicated which would greatly reduce both the dust problem and the heat cost.

Q. *What is meant by an indirect-heat rotary dryer?*

A. One in which the material to be dried is warmed by contact with the heated metal surfaces, which in turn are heated by the medium used (usually furnace gases or steam). Those using furnace gases are called "indirect fire dryers". Atmospheric and vacuum drum dryers are examples of steam-heated indirect dryers, but the type in greatest use is the steam tube dryer. This is often referred to as the "Louisville Type" because of the thousands of Louisville Steam Tube Dryers built during the past 55 years.

Q. *How does an indirect-heat dryer minimize the dust problem?*

A. In an indirect-heat dryer, only enough air is admitted to carry off the evaporated moisture. Thus, the air has nothing to do with the heating of the material. Generally, this low air velocity results in insignificant dust loss.

Q. *How does this differ from the operation of a direct-heat dryer?*

A. In direct-heat dryers, the hot air furnishes the heat for drying besides removing the evaporated moisture. The amount needed to supply the necessary heat results in a sufficiently high velocity through the dryer to carry out an excessive amount of fine material particles.

Q. *It seems I need an indirect-heat dryer. How can I get competent advice and more information regarding my particular requirements?*

A. The Louisville Dryer engineering staff will be glad to analyze your requirements, arrange for necessary pilot plant tests, and submit an unbiased recommendation accompanied by estimated costs. You incur no obligation by using this service.

PROCESS EQUIPMENT DIVISION
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TRADE MARK

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GENERAL AMERICAN TRANSPORTATION CORPORATION

Dryer General Sales Office: 139 So. Fourth Street, Louisville 2, Kentucky
Eastern Sales Office: 380 Madison Avenue, New York 17, New York
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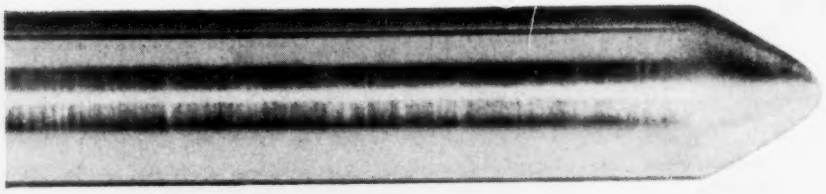
VIRCO-PET 20

VIRCO-PET 20

Note the absence of corrosion from this steel specimen protected with 0.1% Virco-Pet 20 and exposed for 24 hours in a mineral oil-sea water system at 140° F.



ORDINARY INHIBITOR

Note the corrosion on this steel specimen, protected with a 0.1% commercial inhibitor and exposed for 24 hours in a mineral oil-sea water system at 140° F.

THE V-C LINE

Phosphorus, Elemental
Phosphoric Acids
Phosphoric Anhydride
Disodium Phosphate
Trisodium Phosphate
Tetrasodium Pyrophosphate
Sodium Tripolyphosphate
Sodium Metasilicate
Ferrophosphorus
Slag
Dimethyl hydrogen phosphite
Diethyl hydrogen phosphite
Dibutyl hydrogen phosphite
Bis(2-ethylhexyl) hydrogen phosphite
Trimethyl Phosphite†
Triethyl phosphite†
Triisopropyl phosphite†
Tributyl phosphite†
Trihexyl phosphite†
Triisooctyl phosphite†‡
Tris(2-ethylhexyl) phosphite†
Tris(2-chloroethyl) phosphite
2-Ethylhexyl octylphenyl phosphite
Diethyl ethylphosphonate
Dibutyl butylphosphonate
Bis(2-ethylhexyl) 2-ethylhexylphosphonate
0,0,0-Triethyl phosphorothioate
0,0,0-Tributyl phosphorothioate
0,0,0-Triisooctyl phosphorothioate

and other organophosphorus compounds and phosphatic specialties.

†MFD. UNDER U. S. PAT. 2,678,940
‡U. S. PAT. 2,722,479

VIRCO-PET 20 is a versatile new corrosion inhibitor recently developed by Virginia-Carolina Chemical Corporation. In extensive tests, it has shown amazing effectiveness at low concentrations particularly under acid conditions.

Virginia-Carolina Chemical Corporation

Chemicals Division: 401 EAST MAIN ST., RICHMOND 8, VA. • *Phone 2-0113*

PROTECTS ALUMINUM AND STEEL FROM COSTLY CORROSION

Virco-Pet 20 is unique in that it protects both steel and aluminum, by forming a film or barrier on the surface that seals the metal against attack. Tests indicate special utility for these purposes:

Petroleum Equipment—for the protection of engine parts, pipelines, storage tanks, tankers, and other handling equipment.

Protective Coatings—in paint or wax formulations to enhance the metal protection of the coating.

Antifreeze Compounds—to protect radiators, heat exchangers and other equipment containing antifreeze solutions.

Miscellaneous Uses—in cleaners, polishes, solvents, and other products, to prevent container corrosion.

Virco-Pet 20 is a tan-colored, viscous liquid, specific gravity $\frac{20}{4}$—0.96—1.00; viscosity (stokes) 10.5—11.5. Readily emulsifiable in water, Virco-Pet 20 is soluble in acetone, ethanol, ethyl acetate, carbon tetrachloride, benzene, kerosene, gasolene, mineral oil, and ethylene glycol.

If you have a corrosion problem, it will pay you to evaluate Virco-Pet 20. Samples and additional information are yours for the asking. Just write us on your company letterhead. We will reply promptly or send one of our technical men to see you if you so desire.

***VIRGINIA-CAROLINA CHEMICAL CORPORATION** produces:*
V-C Phosphate Rock...V-C Chemicals...V-C Fertilizers and V-C Superphosphates...V-C Multiwall Bags...V-C Cleansers V-C Nemacides...Vicara*, Zycon* and Wavecrepe* zein fibers.

VC CHEMICALS

*REG. U. S. PAT. OFF.

EMERGENCY call to Merchants' Chicago office from steel products manufacturer. Broken acid tank has closed down plant. Need six carboys of Formic Acid immediately.

SPECIAL small delivery truck — held by Merchants for emergency shipments — is loaded. Merchants' assistant warehouseman has union driver's license for just such a situation.

MERCHANTS' SERVICE RE-OPENS PLANT IN 45 MINUTES!

Special service on industrial chemicals is routine at Merchants Chemical. Thirty-five years experience has given Merchants a close understanding of customer problems . . . the kind of understanding that provides ahead of time for emergencies. The instance cited above illustrates the foresighted coordination that is typical of the service available from any one of Merchants' nationwide chain of offices and stock points. Products offered include acids, alkalis, fungicides, surfactants, chlorinated solvents, emulsifiers, laundry compounds, soaps, dry ice and chemical specialties.

WAVED ON at gate by plant guard, Merchants truck speeds past waiting vehicles right through to unloading area.

DELIVERY COMPLETED to waiting lift truck. Total time from initial call — less than 45 minutes!

SERVICE QUALITY MERCO

MERCHANTS CHEMICAL COMPANY, INC.

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SALES OFFICES AND WAREHOUSES: Chicago • Cincinnati • Columbus • Denver • Louisville • Milwaukee • Minneapolis • New York • Omaha

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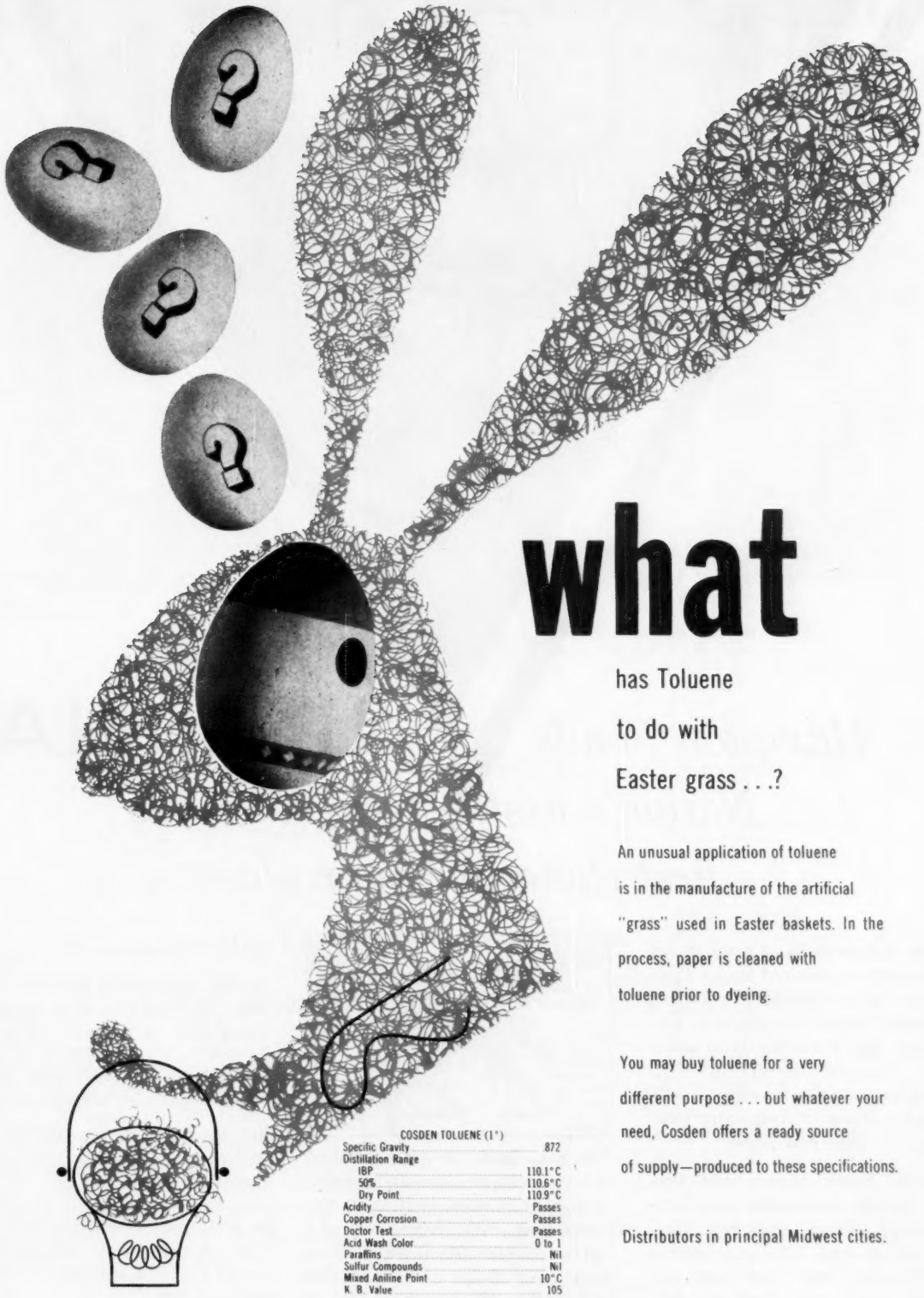


what

has Toluene
to do with
Easter grass . . .?

An unusual application of toluene is in the manufacture of the artificial "grass" used in Easter baskets. In the process, paper is cleaned with toluene prior to dyeing.

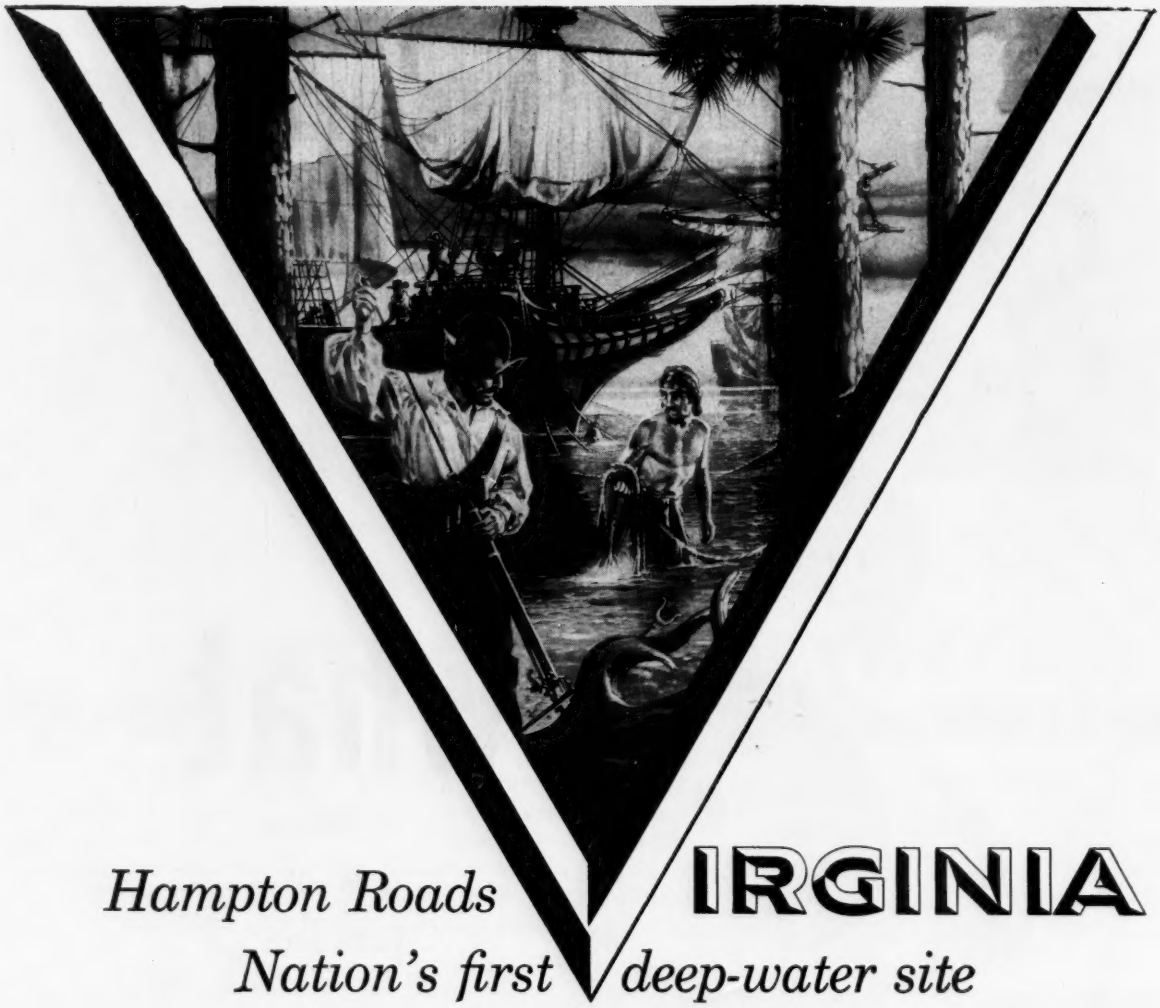
You may buy toluene for a very different purpose . . . but whatever your need, Cosden offers a ready source of supply—produced to these specifications.

Distributors in principal Midwest cities.

COSDEN TOLUENE (1°)	
Specific Gravity	.872
Distillation Range	
IBP	110.1°C
50%	110.6°C
Dry Point	110.9°C
Acidity	Passes
Copper Corrosion	Passes
Doctor Test	Passes
Acid Wash Color	0 to 1
Paraffins	Nil
Sulfur Compounds	Nil
Mixed Aniline Point	10°C
K. B. Value	105

CHEMICAL COSDEN DIVISION

COSDEN PETROLEUM CORPORATION BIG SPRING, TEXAS

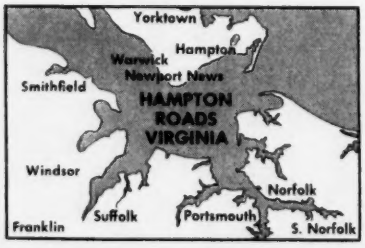


Hampton Roads VIRGINIA

Nation's first deep-water site first choice for your plant

"Our shippes do lie so neare shoare that they are moored to the Trees in six fathom water." So wrote Master George Percy, one of Virginia's first colonists, who sailed into Hampton Roads in 1607. And today, this superb port still offers a choice of deepwater locations for your new plant.

Amoco, Nestle, Lipton and Dow are among the leaders who have recently chosen this key port-industrial area. The competitive advantages they find here can profit your new plant as well.



Top sea, land, air transportation link you with markets and sources of supply. You're central to the whole East, with favorable freight rates to the Mid-West. You have your choice of 9 main line railroads, 45 truck lines, 3 major airlines, and 300 shiplines.

Ample electricity at low cost flows from VEPCO's modern network. Capability is already 1,362,000 kilowatts—and will reach 2,000,000 kilowatts by 1959. Natural gas also serves our area.

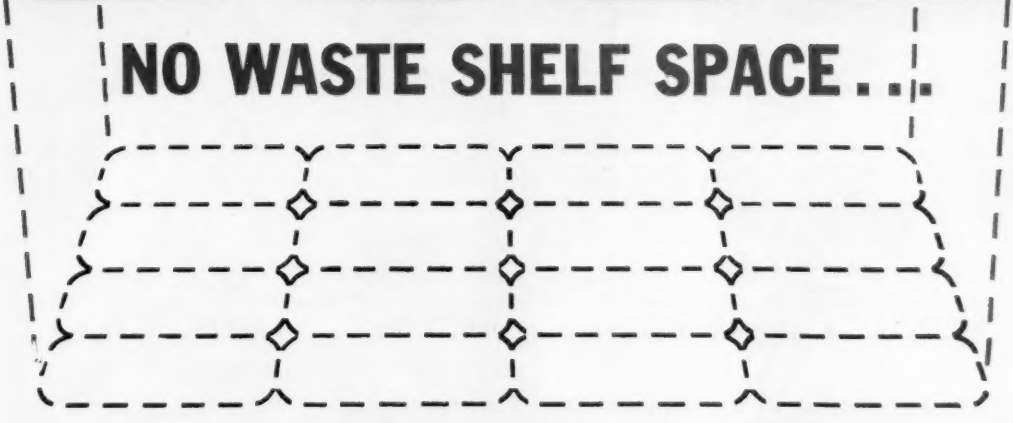
Ask for full facts on mild living-and-working climate . . . young but conservative manpower . . . favorable taxes . . . fine educational, recreational facilities. And for confidential site-finding help, write or phone VEPCO, serving "The Top of the South."

SEE SIGHTS AND SITES! Visit Jamestown Festival, April 1-Nov. 30, 1957. And while here, see some of Virginia's plant sites.

VIRGINIA ELECTRIC and POWER COMPANY
Clark P. Spellman, Director—Area Development
Electric Building, Richmond 9, Virginia • Phone: 86-1411

FLAT SURFACE FOR BETTER DISPLAY...

NO WASTE SHELF SPACE...



with Continental "F" STYLE cans

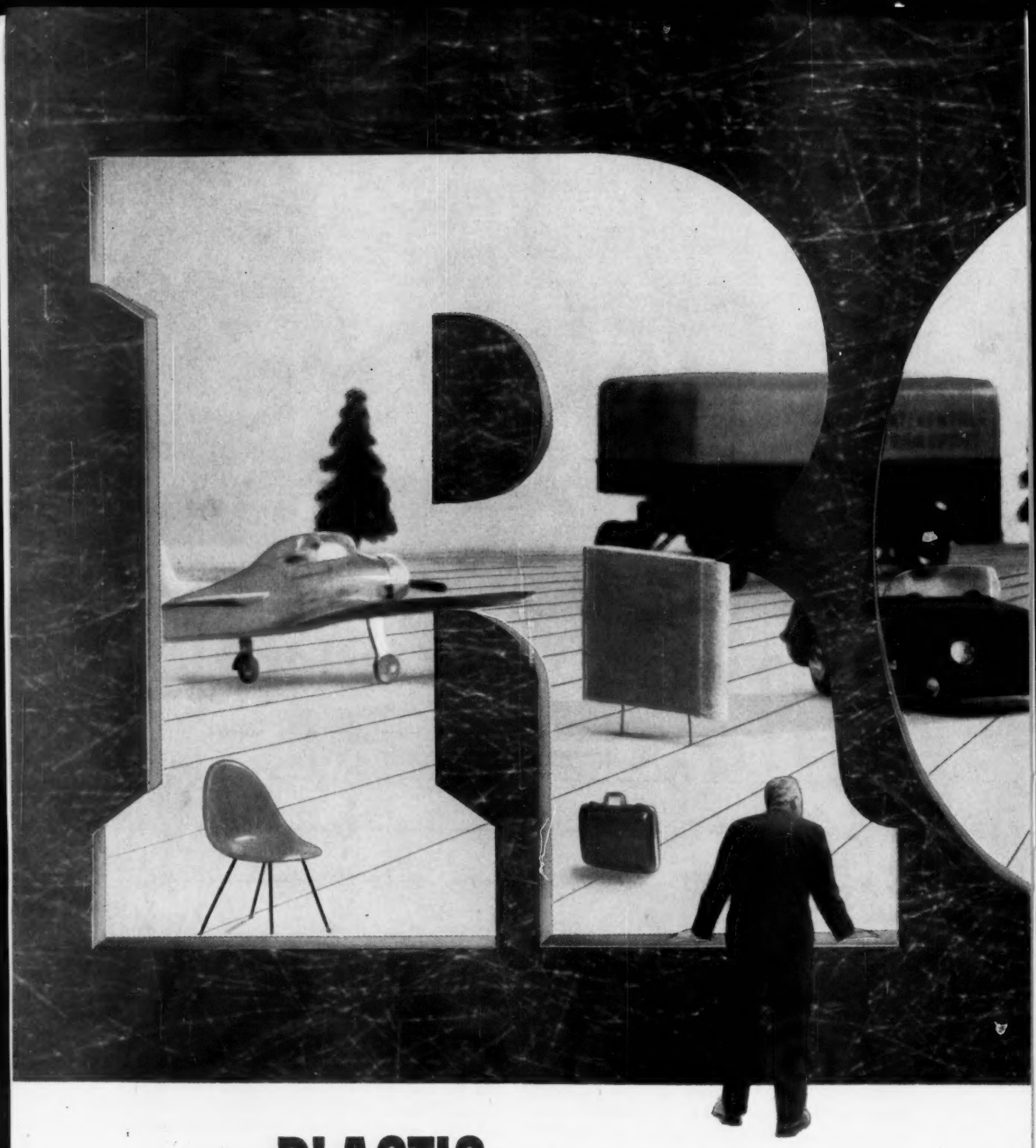
If ever packages were tailor-made to sell your wax, polish and other petroleum products, Continental's "F" style cans are the packages. Handsomely lithographed by Continental master craftsmen, the broad, flat surface of every "F" style acts just like a poster—makes your product more attractive and easier to see. And, because of their space-saving, oblong shape, "F" style cans let grocers stock *more* of your product per shelf foot, meaning greater sales opportunities.

Let us start you off with all the "F" style cans you need. Sizes four ounce (spout top) to one gallon. Then, if you need engineering or research help, it's available as part of our Tailor-Made Package Service. Call soon for the packages with more "see," more "sell"—Continental "F" style cans. Rapid delivery from shipping points across the U. S.

CONTINENTAL CAN COMPANY

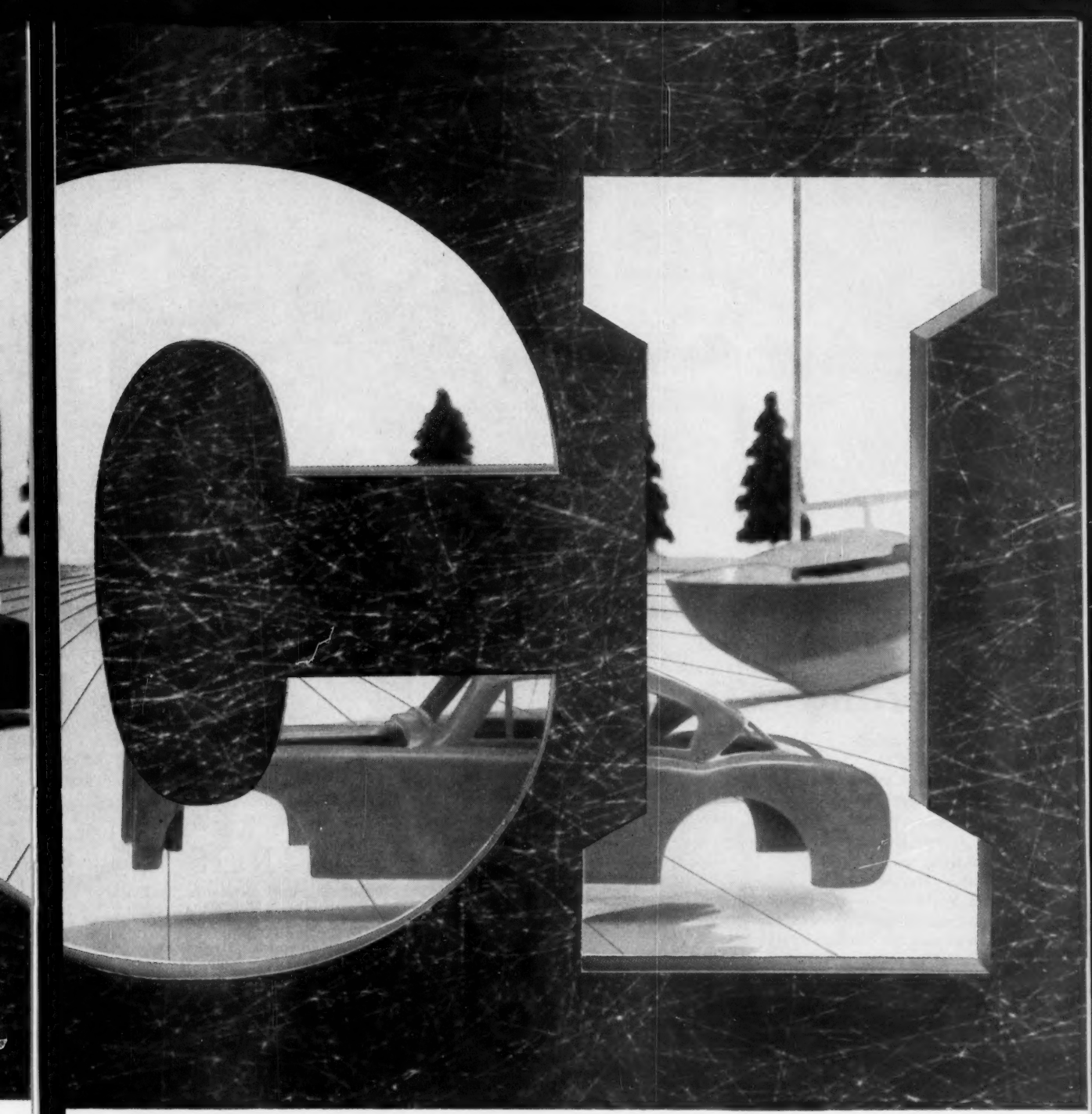
Eastern Division: 100 East 42nd Street, New York 17, New York
Central Division: 135 South LaSalle Street, Chicago 3, Illinois
Pacific Division: Russ Building, San Francisco 4, California

QUALITY Continental SERVICE



LOOK FOR IMPROVED **PLASTIC** PRODUCTS

THROUGH RCI CREATIVE CHEMISTRY



Research and development projects continue to improve the properties of plastics. One profitable result of this *creative chemistry* is new applications. Another is increased soundness in older applications.

Reichhold, one of the world's leading producers of synthetic resins, works closely with the manufacturers of plastic products. This cooperation results in RCI Polyester, Phenolic, Melamine and Epoxy resins that are tailor-made for customer needs.

If you have a problem involving these resins, write RCI for help in solving it. And remember that, in addition to synthetic resins, RCI supplies basic materials for their manufacture – such as high quality phenol, formaldehyde, maleic and phthalic anhydride.

Creative Chemistry . . .
Your Partner
in Progress

RCI **REICHHOLD**

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sebacic Acid • Sodium Sulfite • Pentaerythritol • Pentachlorophenol • Sulfuric Acid

BEHIND THE NEWS

HYYPIA AT CMRA MEETING: A context for facts, a perspective for opinions by . . .

Reporting with a Reel

Behind our article last week on the Commercial Chemical Development Assn.'s annual meeting lay a lot of questioning and probing by three *CW* editors—Tony Piombino, John Winton and Jorma Hyypia—plus a strong assist from a tape recorder.

Jorma Hyypia (that's a Finnish name, by the way, in case you've been wondering) is not only a spelunker and a camera fan, but also a hi-fi buff. Although his magazine work hasn't taken him into any caves, his hi-fi hobby has figured into his reporting. He didn't tape any CCDA panel discussions for fear that the sight of the machine would discourage frank comments—but he did record his question-and-answer interviews with a score of individual registrants.

At the Chemical Market Research Assn. meeting a couple of weeks earlier, he obtained permission to record the speeches and ensuing discussions from the floor (*see cut*). Back at the office, he edited his reel of tape, transferred portions to a dictating machine, had the disc transcribed. From this transcription, he and Winton put together their stories (*CW, March 23, p. 74, p. 78*).

An editor can, of course, get copies of the major speeches given at most meetings, and a meeting could be "covered" without stirring from behind a desk. But it's no detraction from the speakers to point out that a great deal of value is found in post-presentation discussions, informal conversations in the lobbies, and cocktail-hour talk at the end of a jam-packed day. And *CW* editors are there, renewing old friendships (and asking a few pertinent questions).

A tape recorder must be used judiciously. The whirring of the tape, like the scratching of a pencil on a note pad, will often make a man reticent. And it must be used honestly, of course, with no intent to deceive. But used properly, it can capture the whole sense of a meeting far better than a mere reading of the speeches or even than taking hurried notes. From this kind of coverage comes more than simple reporting of an event; there comes a context, a perspective, in which all facts and opinions take their proper place.

A word of caution. Tape recorders, like electronic computers and a host of other gadgets, are convenient devices for storing information. (The computer, of course, goes a step further and carries out predetermined operations with the information.) But a recorder has no judgment, and that's where a knowledgeable writer begins to earn his keep.

Howard C. E. Johnson
Editor

MEETINGS

Bituminous Coal Research, annual meeting, the Greenbrier, White Sulphur Springs, W. Va., April 18-19.

American Industrial Hygiene Assn., conference, Kiel Auditorium, St. Louis, April 22-26.

Assn. of Consulting Chemists and Chemical Engineers; symposium: International Science, a Catalyst for World Security; Belmont Plaza Hotel, New York, April 24.

Armour Research Foundation of Illinois Institute of Technology, national industrial research conference, Conrad Hilton Hotel, Chicago, April 24-25.

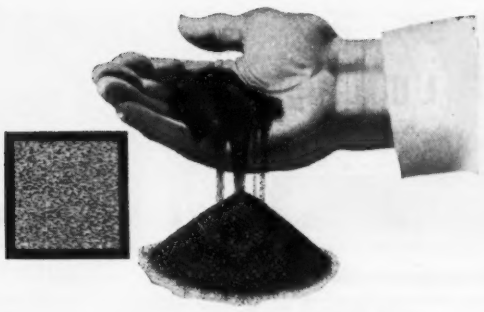
American Zinc Institute, 39th annual meeting, Drake Hotel, Chicago, April 25-26.

Scientific Apparatus Makers Assn., 39th annual meeting, the Greenbrier, White Sulphur Springs, W. Va., April 27-May 2.

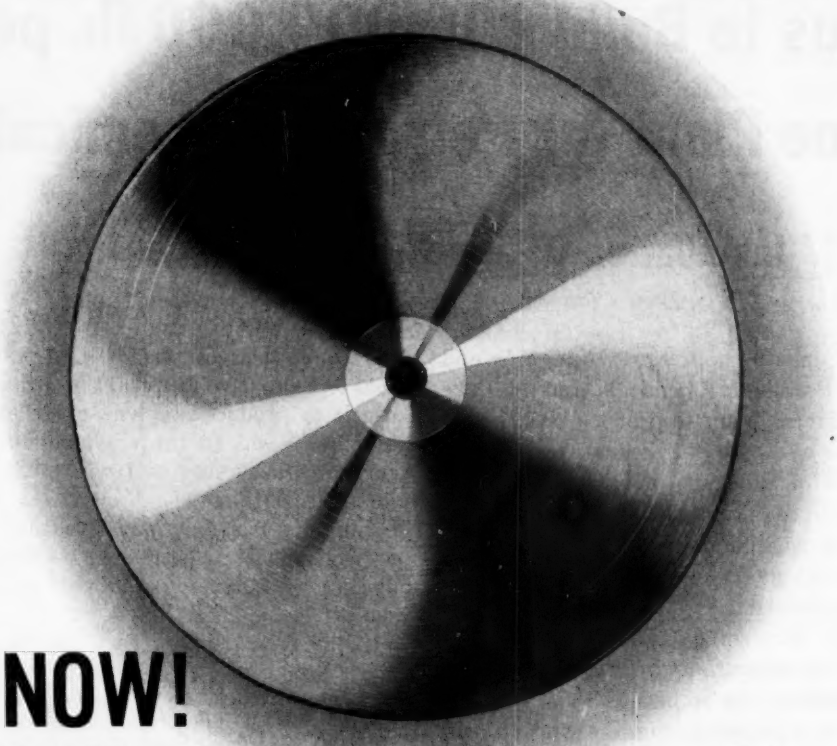
American Oil Chemists' Society, 48th annual meeting, Roosevelt Hotel, New Orleans, April 29-May 1.

American Material Handling Society, materials handling conference, Convention Hall, Philadelphia, April 29-May 3.

First to lithograph drums



First to shot-blast drums



NOW!

New Rheem Centrifugal Sprayer gives you a lining completely uniform drum after drum after drum

Now, from Rheem who pioneered the improvement of drum *exteriors* by multi-color lithography, comes a new improvement for lining drum *interiors*. It's Centrifugal Spray Coating which, with Rheem high temperature curing, assures a new high in quality linings.

This method applies lining materials to drum shells without skips or misses. Every lining is completely uniform on all surfaces—won't vary from one drum to the next, one day to the next.

Above, you see the wheel-shaped business end of this new sprayer invented by Rheem. Hundreds of tiny holes puncture the wheel's edge. As this spray wheel enters the drum, it spins at a high, *constant* speed. The centrifugal force casts off a continuous, uniform curtain of finely atomized lining material.

The drum does not rotate. Only the wheel spins. The spray always travels the same distance to coat the surface. And this, plus the fact that there's no air used in the spray, eliminates air turbulence. No dust, dirt, or oil get into the linings as they do in linings applied the conventional way. Too, centrifugal spraying minimizes pinholing and blisters caused by evaporation of solvents during curing. For now lining materials with a *lower* solvent content are used.

With these new developments Rheem again leads the way by perfecting its product to better protect yours. For full details, contact our nearest office.

YOU CAN RELY ON Rheem WORLD'S LARGEST MAKER OF STEEL SHIPPING CONTAINERS

Rheem Manufacturing Company

Richmond and South Gate, Calif. • Chicago • Linden, N. J. • New York • Houston • New Orleans • Sparrows Pt., Md.

Lummus to Build 200,000,000 lb. per Year Ethylene Plant for Petroleum Chemicals, Inc.

Installation Designed for 50% Expansion

The Lummus Company is presently designing and will build for Petroleum Chemicals, Inc. at Lake Charles, Louisiana a plant to produce 200,000,000 pounds per year of ethylene. Scheduled for completion by the end of 1957, the plant is designed to permit expansion of output to 300,000,000 pounds.

The plant will use Lummus' ethylene process and will draw refinery gases supplemented with LPG from the nearby refineries of Cities Service and Continental Oil, by whom P.C.I. is jointly owned. Ethylene will be made in two grades — the top grade 99.8% pure — the second 98.5%. By-products will be 95% pure propylene, C_4s, and an aromatic distillate.

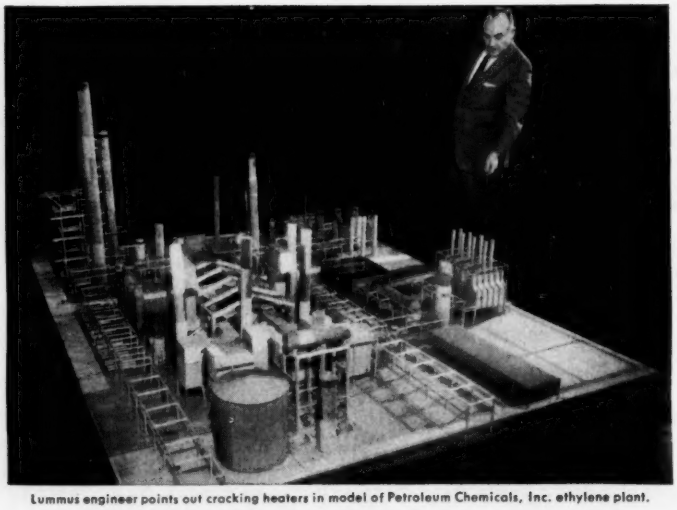
Cracking section of the plant features an improved Lummus heater which embodies years of research and development by Lummus' Heater Division. Equipment in the Lummus-designed low-temperature fractionation unit includes 12,500-hp gas turbines which drive the centrifugal charge and refrigeration compressors; exhaust from these turbines generates high-pressure steam in three waste heat boilers. The system utilizes high efficiency expanders to recover very low temperature refrigeration.

This plant brings the total of Lummus designed ethylene plants to 14, with a combined capacity of over 3 million pounds per day.

Part of the new plant's ethylene output will be sold to Calcasieu Chemical Corporation, which will use it to produce ethylene oxide and glycol in a plant adjacent to the ethylene unit. Lummus is currently designing and will build the Calcasieu installation.

Lummus has over half a century of experience with chemical and petrochemical projects. Why not discuss your next project with a Lummus representative.

THE LUMMUS COMPANY, 385 Madison Avenue, New York 17, N. Y. *Engineering and Sales Offices and Subsidiaries:* New York, Houston, Montreal, London, Paris, The Hague, Bombay. *Sales Offices:* Chicago, Caracas. *Heat Exchanger Plant:* Honesdale, Pa. *Engineering Center:* Newark, N. J.



Lummus engineer points out cracking heaters in model of Petroleum Chemicals, Inc. ethylene plant.

Business
Newsletter

CHEMICAL WEEK
April 13, 1957

Backers of the "good faith" pricing bill are losing heart. Business lobbyists now count a slim-to-heavy Senate Judiciary Committee majority against the bill. The reverse was true when hearings on the bill began. And House-sponsor Rep. Wright Patman (D., Tex.) admits the chance of getting a floor vote on the bill in either Senate or House is fading fast.

Bar "good faith" defense to drug, cosmetic and food sellers only? The idea was advanced by Sen. Homer Capehart (R., Ind.) last week. But he advanced it tongue-in-cheek—thus pointing out the dwindling support for the bill, even among supposed beneficiaries—retailers, jobbers. Actually, Capehart is dead set against limiting any supplier's right to meet a competitor's lower price (*CW, March 2, p. 6*).

•

Wyandotte plans a new oxide products unit for its home city (Wyandotte, Mich.), hopes to have it onstream by late '57. The $3-million plant, with "multimillion" pounds/year capacity, is designed to make a variety of products, including polyethers for use in polyurethanes, and the nonionic surface-active agents, the Pluronics, and Tetronics.

Columbus, O., on the other hand, is losing a detergent plant. In July, Monsanto will move its packaging operation for the syndet All to its Trenton and Kearney, N. J., plants. Reason: for more efficient operation.

•

How to hush the clamor for tougher air pollution control laws? Chemical management got some advice on this point at a water and air pollution abatement conference sponsored by the Manufacturing Chemists' Assn. last week. Their advisor, H. C. Ballman, of the Air Pollution Control Assn., urged the industry to take the lead in research to pinpoint "nose level" (near the ground) pollution concentrations. Too many community air pollution authorities, he charged, are basing standards on emission rates at the pollution source (e.g., the factory smoke stack)—and these standards "are ever changing, based on the ability of control agencies to make them more restrictive."

•

Metal & Thermit's annual meeting will not be postponed until June as a committee of independent stockholders and officers had hoped *(CW Business Newsletter, March 30)*. Judge Mark A. Sullivan, chancery division of New Jersey superior court, in denying the request, said the committee "had not established any of the charges it asserted"—charges that M&T management made fraudulent statements in its annual report.

But the committee of independents hasn't given up. This week it appealed the ruling in the appellate division of New Jersey superior court.

Goodrich-Gulf's synthetic rubber plant at Port Neches, Tex., was shut down this week as a result of strikes against B. F. Goodrich tire plants. The shutdown means an indefinite layoff for some 400 hourly workers, although their own local union is not involved in the strikes. Operations of B.F. Goodrich Chemical, with exception of its Akron plant *(CW Business Newsletter, April 6)*, have been unaffected.

Butadiene units that adjoin the Goodrich-Gulf plant won't close unless the strike is "prolonged." According to management of Neches Butane Products Co. and Texas-U. S. Chemical Co., butadiene production is already somewhat lower right now than it was last year at this time, but no further cutbacks seem necessary.

•

One merger on, one merger off.

Commercial Solvents and Thermatomic Carbon have joined up as expected (*CW Business Newsletter, Feb. 23*). By exchanging 18 shares of CSC common stock for each share of Thermatomic, CSC assumed full control of the carbon black producer, in which it formerly held about 68% ownership. There will be no change in name of either firm.

But Clopay and Chemical & Industrial Corp. have called it quits. The proposed plan that would have merged the firms *(CW, Feb. 23, p. 21)*, according to C&I, "has been dropped and negotiations . . . definitely terminated. C&I will continue its normal business of designing and constructing plants. . . . with no changes in corporate setup or business . . ."

•

Shell Oil Co. will build Canada's first epoxy-resin plant in Montreal, alongside its present Montreal East chemical works. The $1-million resin unit is expected to be in operation by early next year. Shell, too, has already begun expanding several of its chemical units there. It now makes secondary butyl alcohol and methyl ethyl ketone, and is building a unit to make detergent alkylates.

•

Linde has boosted wages at two of its plants. The industrial gas producer last week signed a two-year contract with the International Chemical Workers Union providing a 12¢ across-the-board raise and other benefits to employees at its North Pittsburgh and Duquesne, Pa., plants. Wage provisions can be reopened after one year.

At its Tonawanda, N. Y., plant, which is being operated by supervisory personnel since members of Oil, Chemical and Atomic Workers are on strike, Linde has tried a variation of the recorded telephone message technique to keep operating personnel up to date on plant news. The plan has been tried before at other Linde plants to transmit company news on a general basis; at Tonawanda, the number is unlisted, is distributed only to nonstriking employees.

HOW THE SILICONES MAN HELPED...

Deliver a Hot Blast to Cold Jets!

Get 'em into the air *fast!* But, complex machinery must be warmed up . . . and pumping high temperature, high pressure air into the jet engine melts ordinary hoses. The solution: A tough, flexible hose with two inner layers of high temperature silicone rubber bonded to an outer cover of closely woven "Dacron" fiber.

Developed by Quaker Rubber Division, H. K. Porter Company, Inc., Philadelphia, Pa., this hose utilizes UNION CARBIDE Silicone Rubber to resist temperatures from +450 to —80 deg. F. Weighing less than one pound per foot, it offers great flexibility for ease of handling, and is highly resistant to abrasion.

This is another example of how the UNION CARBIDE Silicones Man has helped solve an "impossible" high temperature problem. Oils and emulsions, resins, rubber stocks, intermediates and monomers are discussed in "Look to UNION CARBIDE for Silicones." Write for your copy. Dept. L-43, Silicones Division, Union Carbide and Carbon Corporation, 30 East 42nd St., New York 17, N. Y.

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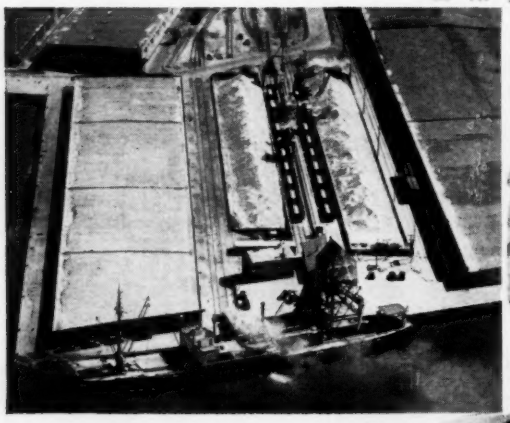
sulphur

helps to create headline products



Naturalists have said that the forests would take over our cities in short order should all human activity cease. Railroads see vivid evidence of this on a small scale. They're constantly battling weeds on rights-of-way, on sidings, on spur lines.

Today, the battle is being fought more successfully than ever before with a new and powerful broadleaf weed killer 2, 4-D. And this chemical is proving useful, too, in suburban areas.

Where does Sulphur fit into the picture? It takes Sulphur to make sulphuric acid. It takes sulphuric acid to make phenol. It takes phenol to make 2, 4-D.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N.Y.
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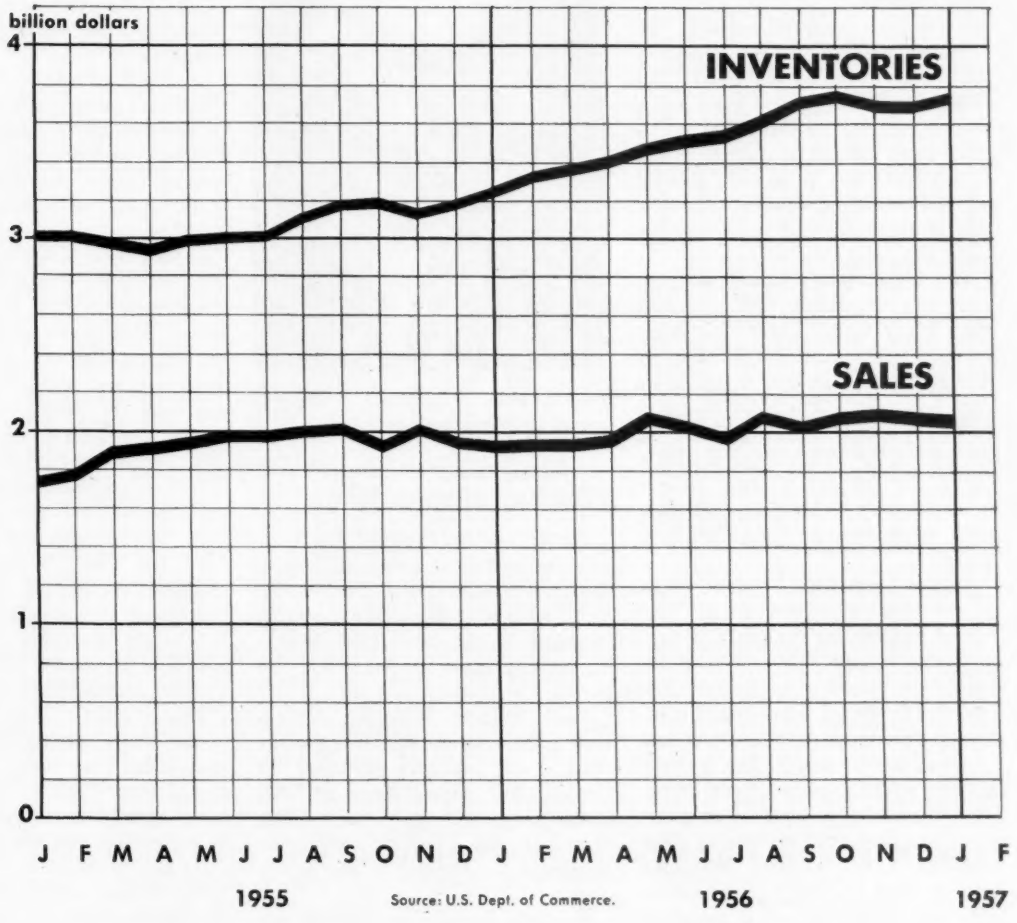
Sulphur Producing Units
- Newgulf, Texas
- Moss Bluff, Texas
- Spindletop, Texas
- Worland, Wyoming



Source: U.S. Dept. of Commerce.

Are Inventories Growing Too Fast?

Chemical inventories are growing faster than sales—ordinarily a danger signal. Are they growing too fast for comfort? Answer is, a *CW* survey shows this week, that there's no cause for alarm.

True, a glance at the chart above shows that chemical inventory buildups have been large; and while they eased somewhat toward the end of 1956, on-hand values are still ahead of where some executives think they should be.

To those questioned by *CW*, boosted inventories have come as no surprise. Most companies explained them as a logical outgrowth of several factors—most important of which were sales increases in late 1956 and early '57, which required substantial inventory. "Of course, you can't overplay the close connection between sales and inventories," says one chemical executive. "As sales go up, you've naturally got to have enough material on hand to take care of the orders."

Not That Easy: But it's not quite as simple as that, most agree. There's a slight surplus in many branches of the industry that can't be accounted for in terms of sales predictions alone. Other factors have contributed.

For one thing, companies had a hard time meeting demands during the '55 boom year when sales and profits hit new highs. Companies then reported serious drains on available inventories: as quickly as goods were produced, they were sold, leaving an "unsafe" margin if there should be large sales increases. Now, these firms say, they're widening the gap to a more normal position, and inventory-to-sales ratios are really not much different

from what they were as little as five years ago—with on-hand materials roughly able to provide for 1.7 months' sales.

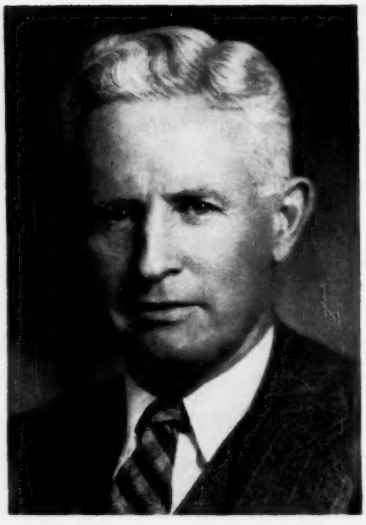
Revalued Inventories: Higher prices were another "apparent inventory" builder. One executive explains, "Inventory poundage may not actually be up so very high, but its dollar value is—and that's the yardstick we use to measure it. For instance, suppose we use a given amount of chlorine in one of our operations. If the price goes up, so does the dollar value of our chlorine inventory, even though we're not using any more than we used to."

But higher prices played a significant role in another, more realistic way. Many firms, aware that prices on such things as dyestuffs, methanol and ammonia were due to go up on Jan. 1, bought a little more than they ordinarily would. While it's not the accepted policy to stock up for months ahead just because a price increase is on the way, many firms did liberalize their buying policy to some degree.

Special Cases: Other factors, peculiar to individual companies, have helped to swell the industry's average inventory volume. Mergers in recent years have played a big part: companies that developed a substantial number of new products necessarily had bigger on-hand volumes. Too, a shaky Mideast situation caused users of petroleum products to build up an emergency supply. Labor troubles in some segments of the industry influenced firms to stock up. The farmers' recent economic problems and a long-lasting drought throughout the Southwest put fertilizer supplies ahead of demand — and there are other similar individual influences that have had their effects.

While all of these factors do not apply universally, their cumulative effect has helped to push the inventory average upward. There's no real worry about overproduction, no real evidence of a serious letup in demand for chemical products.

Government economists, while they're not yet releasing any figures, hinted that inventories for February and March were down slightly from the late months in '56. And chemical makers, watching inventories closely, are looking to healthy inventory-sales balances the rest of the year. There's no sign that trends will reverse.



HOOKER'S MURRAY: Niagara power problems are immediate.

Hooker Hopes High

Hooker Electrochemical Co. management foresees no long-range trouble from the Niagara power situation. But board chairman R. Lindley Murray conceded to the New York Society of Security Analysts last week that power is a problem right now.

Since Niagara Mohawk's Schoellkopf power station tumbled into the river, power has been expensive for Hooker, but expectations are that cheap power will again be available when the new Lewiston power development is completed in four or five years.

Hooker's first-quarter earnings are down 14.8¢/share from a year ago, due not only to higher power and other costs but also to lower sales. Main reason: production and inventory cutbacks among customers in rayon and in pulp and paper industries, a situation that Murray believes will be only temporary.

Sales in 1957 should be higher than last year's, Murray says, and costs should be lower. A cost-cutting program aimed to save $3 million/year, or 22¢ a share, has been started (but it will be too late to save more than $2 million in '57).

Capital expenditures will be about $75 million over the next five years. Of this, 70-75% will be used to increase capacity (40%), mostly in the company's Niagara Falls plant complex.

PRDC Plans Advance

The Atomic Energy Commission hearing on the proposed $43-million power reactor proposed by the Power Reactor Development Co. at Monroe, Mich., has reached an important milestone.

The project—being contested by the AFL-CIO auto, paper and electrical workers unions in precedent-breaking hearings before a special hearing examiner—got a favorable boost last week when AEC signed a research and development contract with the company. It calls for AEC to provide $4,450,000 for research and development work in AEC facilities and to waive normal charges—estimated at $5 million—for nuclear material the plant will use during a period extending from the signing of the contract to five years after an operator's license has been issued to PRDC.

The contract also provides that AEC do the chemical processing of fuel elements, although the company will bear the cost. Under cancellation clauses, the company can cancel the contract if satisfactory liability insurance is not obtainable. A similar contract had previously been signed with Yankee Atomic Electric Co.

This contract—which had been part of the PRDC project right from the start—may have been signed a little sooner than it would otherwise have been, because of hearings on safety of the project and the company's alleged lack of financial ability to swing it. The unions fighting AEC's issuance of a construction permit claimed that the financial backing offered by PRDC was insubstantial—since a major part of the financing depended on contracts with AEC that had not yet been signed, and hence were not to be considered as substantial evidence of financial ability to perform.

PRDC was able to show a further indication of its financial prospects. Last week, it borrowed $2 million from pension trust funds supervised by a number of New York banks. The $2 million is but the first installment of $15 million that PRDC will obtain from the banks during a two-year period.

Safety Hearings Continue: The hearings before Examiner J. A. Kyle are continuing, with the company completing its list of witnesses this week. After a recess, it then becomes the

turn of union lawyer Benjamin Sigal to present the witnesses that will carry his case over to the offensive. So far, Sigal has been mostly attacking witnesses PRDC has had on the stand to defend its case.

One bit of mystery has finally been cleared away with the revelation of the unions' source of technical advice. It comes from Bernhard Spinrad, assistant director of the reactor engineering division at AEC's Argonne National Laboratory at Chicago.

Sigal has indicated that he plans to subpoena members of the AEC's reactor safeguards committee in behalf of his case. This committee's questioning of PRDC's safety data laid the groundwork for the unions' case.

AEC, which has a special staff assigned to represent it at the hearing, may also call members of the safeguards group in its behalf.

'Godiva' Controversy: One highlight of recent testimony was the success of the unions in getting into the record, over the protests of PRDC, a statement by Sen. Clinton P. Anderson (D., N.M.) about the so-called Godiva reactor incident at Los Alamos. (An experimental device known as Godiva was involved in a runaway atomic reactor incident.) The union contended that this statement contradicted earlier testimony offered by the AEC's reactor chief, W. Kenneth Davis, on reactor safety questions.

As the hearing proceeded, Senator Anderson introduced a bill that would make such hearings mandatory on all future nuclear power and test reactor projects. Anderson's bill would also give the safeguards committee—now merely an advisory group—more standing and require public disclosure of all their reports on future projects except where classified information is involved.

Meeting in Miami

In warm, sunny Miami this week, 7,000 members of American Chemical Society were gathered together for a week of meetings, fun, and serious talk about new developments in the broad chemical spectrum. More than 1000 papers, ranging in subject matter from the development of fire-fighting cellulosic molecules to new developments in antibiotics, are being given.

CELANESE'S KOHN: He studied Mexico, found that . . .

To Grow in Mexico Do a Little Extra

In Ocotlan, Mexico, this week, Celanese Mexicana employees are getting ready for festivities marking completion of the firm's 10th year of manufacturing acetate filament. But more than an anniversary, the celebration is a prelude to Celanese's entry into the purely chemical field late this summer with the production of formaldehyde resins.

In the decade since its initial startup at Ocotlan, Celanese has made big strides in its ventures in that country, largely because it takes particular care to ensure Mexican cooperation on all levels, ranging from labor to government. From the one product made in one plant, the company has expanded until it's now turning out 26 products in five plants. Its sixth and newest venture, the formaldehyde resin unit is under construction on the outskirts of Mexico City. And later this month, festivities will inaugurate the latest plant—a nylon-6 facility—to make German perlon.

In addition, Celanese has:

- Expanded its range of supply, now serves not only the textile industry but also 10 other industries. Item: four new plants have been built by other firms and seven others have expanded as a result of Celanese growth.
- Plowed back its profits to a point where its initial investment of less than $5 million has grown to $17.7 million.
- Increased its payroll from 615 employees (10% of them non-Mexican) to 3,860 (less than one half of one percent non-Mexican).

Investment in Mexico came largely upon the recommendations of George Kohn, now vice-president and general manager of the firm. In the 1940s—at the request of Harold Blancke—then treasurer and now president of the U.S. Celanese Corp.—Kohn checked the possibilities of investing in Mexico. He reported favorably, in spite of the fact that two other U.S. firms had turned down invitations from Mexico because of jitters left in the wake of the now-famous Mexican government's 1938 oil expropriations.

Justifying Celanese's faith is the fact that in the decade since it set up in Mexico, the firm has experienced no "anti-gringo" resentment, often met with by branches of foreign companies. By doing somewhat more than meeting legal requirements in plant communities, Celanese has fostered considerable appreciation.

Control Shift: When it incorporated in 1944, it did so in partnership with Mexican capital. At first, American Celanese held the majority of stock, but during the past decade it has purposely permitted the bulk of interest to pass to Mexicans.

Aside from its investment interests, Celanese Mexicana has cooperated wherever possible with local authorities in a number of community endeavors—for example, the construction or modernization of hospitals, schools and streets.

To combat price inflation, the company has set up cooperative stores, which sell basics at wholesale prices to workers and their families. It now successfully operates three stores. In addition, Celanese personnel are teaching in local schools. The company has established scholarships in Mexican universities.

After 10 years of steady growth, the company isn't going to sit back and relax, says Kohn. "When there's a sufficient market—and potential—to justify building a plant, we try to move in." And so far their attempts have been successful. A Mexican government department director sums it up this way: "I don't know who'll get the green light on a new project that's coming up, but I do know that Celanese usually accomplishes what it sets out to do."

EXPANSION

Nylon: Du Pont of Canada will spend about $7.5 million to expand its nylon plants in Kingston and Maitland, Ont. Facilities now turning out nylon tire cord at Kingston will be converted to produce staple fiber and yarn.

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Sulfuric Acid: Canadian Industries Ltd. will build a 150-tons/day oleum and sulfuric acid plant near Beloeil, Que. Both products will be used at CIL's Beloeil works to manufacture agricultural chemicals and explosives. Some of the output will go to consumers in the Montreal area.

•

Phosphates: Bear Creek Mining Co., subsidiary of Kennecott Copper Co., is negotiating for mineral rights on 250,000 acres in Beaufort County, North Carolina. A company spokesman said the firm plans to do extensive exploratory work preliminary to building a pilot plant and, later, a processing plant if sufficient deposits are proved.

•

Alkylate: Shell Oil Co. will add a sulfuric acid-alkylation unit to its refinery in Anacortes, Wash. The new unit will turn out 2,400 bbls./day of alkylate, should be ready by mid-'58. Fluor Corp. (Los Angeles) will engineer the project.

•

Explosives: American Cyanamid will boost its production of industrial explosives by 60% by rebuilding and putting on an extra production shift. Major part of the increased production will come from the firm's New Castle, Pa., plant, which was heavily damaged last year when an explosion temporarily halted its operations. Now Cyanamid will build 10 new buildings at New Castle, add a crew to boost its former capacity. The building program is scheduled for completion by Sept. '57.

COMPANIES

Kaiser Industries Corp. is negotiating to acquire McEachern Investment Co. (formerly General Construction Co.). Present terms call for McEachern stockholders to receive 2,272,000 shares of Kaiser Industries common and 410,000 shares of its $50-par, 6½% preferred, convertible into common stock at $18/share.

In return, Kaiser would get McEachern assets totaling 1,164,000 common shares of Kaiser Aluminum & Chemical Corp., 527,000 shares of Permanente Cement Co. and about $6.3 million in cash and other securities.

•

Vitro Corp. of America will offer 178,646 shares of its common stock to shareholders of record April 2 on the basis of one new share for each five shares held. Proceeds from the sale, about $2.9 million, will be applied toward Vitro's $7-million capital spending program planned for '57. The new projects include: a $930,000 laboratory at Silver Spring, Md.; $1.1 million to raise capacity of Vitro's Canonsburg, Pa., plant, which processes uranium, nickel, cobalt and copper residues; $1.07 million to install a new uranium solvent extraction process at the firm's Salt Lake City unit and between $750,000 and $2.5 million to cover the cost of now-pending contracts in the company's construction division. Blyth & Co. Inc. will underwrite the issue.

•

St. Regis Paper Co. plans to acquire up to 95% control of St. Paul & Tacoma Lumber Co. through an exchange of stock. The paper firm has registered with the Securities & Exchange Commission 850,000 shares of $5-par common stock, which it plans to exchange in the ratio of 56⅔ shares of St. Regis for each share of the lumber company's stock.

FOREIGN

Pigment/Mexico: Du Pont's Mexican affiliate, Dupont, S. A. de C. V., is awaiting approval from its parent company before proceeding with the construction of a new titanium dioxide plant in Veracruz. The $2.8-million facility will be the first titanium pigment plant in Mexico. Last year, the country imported more than $2.4 million worth of the material. Eventually, the plant will use only Mexican ilmenite.

•

Salt/Mexico: Dow Chemical has bought 50% interest in Sales y Alcalis S. A., a Mexican corporation that owns extensive salt mining rights in Veracruz. Dow will use the salt in future manufacturing of caustic soda and other alkali derivatives, chlorine and related products at Cootsaqualcos.

•

Sulfur/Iraq: Bids are due June 25 on a government-owned sulfur recovery project to produce about 350 tons/day of sulfur from natural gas. The work includes engineering, supply, erection and commissioning of the plant for the recovery of both elemental sulfur and liquefied petroleum hydrocarbons from natural gas. The plant will be built near the installations of Iraq Petroleum Co. (Kirkuk).

•

Acrylonitrile/Japan: Chemstrand Corp. will give technical assistance to Mitsubishi Chemical Industry Co., which is setting up a plant at Fukuoka to make Acrilan. Cost of the plant, which will produce 500 tons/month of hydrocyanic acid and 600 tons of acrylonitrile, will be about $5 million. It is scheduled for completion by Sept. '58.

•

Polyethylene/Australia: Imperial Chemical Industries will build a $4.2-million polyethylene plant at Sydney, Australia, aimed at saving Australia $2.8 million/year in imports.

Dowicide preservatives prevent product breakdown

. . . protect quality in bottled products

If you examine closely the reasons for the success of a bottled product, you'll always find one important factor present: product stability. Ingredients must resist deterioration and maintain quality over long periods of time.

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WHAT IS LITHIUM?

The fact is, lithium metal is all of these things . . . *and many more.*

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At the same time an exciting new chapter of lithium is being written in the atomic energy field. Having two isotopes with almost opposite characteristics, lithium becomes potentially useful in nuclear applications. And with its derivatives, lithium also shows great promise in the production of high energy fuels.

These are just a few of the better known applications for lithium metal . . . all relatively new. That's why chances are that you, too, will be using this lightest of all metals in the next five years . . . in research, in production, or in the manufacture of your product. Foote's vast amount of technical data, backing up its production of 99.8% lithium metal is ready to help you get there faster—maybe first. Our Data Bulletin *Lithium Metal* is a good start. Your copy is awaiting your request at the Technical Literature Department, Foote Mineral Company, 420 Eighteen West Chelten Building, Philadelphia 44, Pa.

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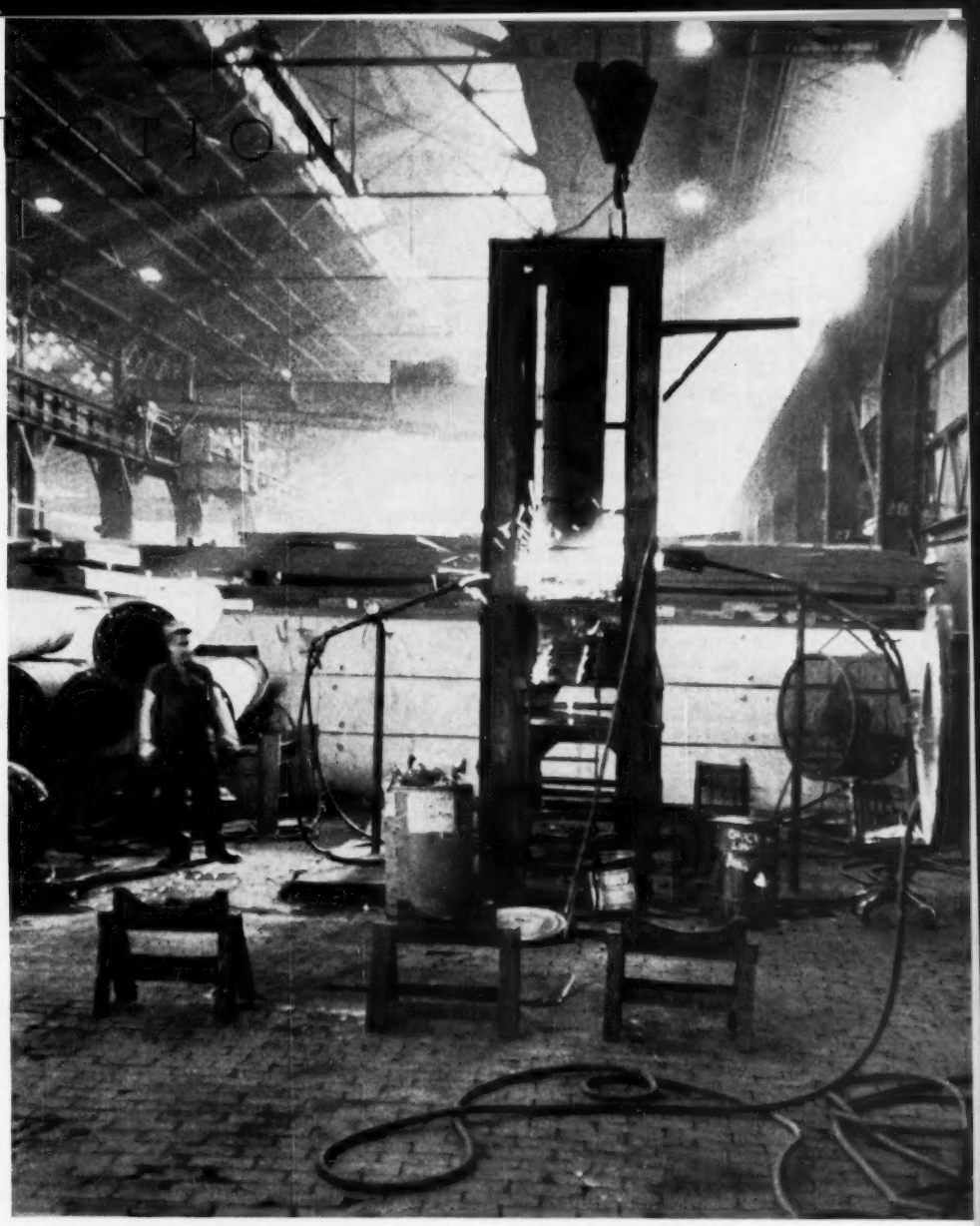


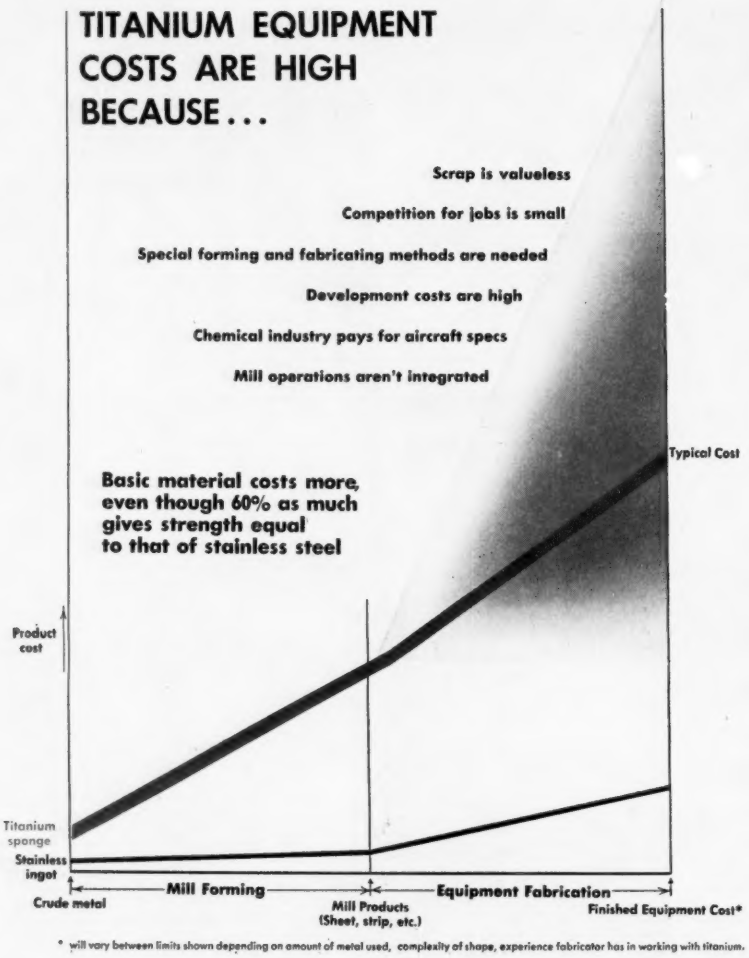
Mill workers play heat on bottom of crucible to remove sticking titanium ingot. A "sticker" doesn't happen often, is one of the easiest of titanium's many problems to solve. As availability of the metal increases, there will be a rush to put . . .

New Heat on Titanium Problems

Mill products are available for chemical equipment. But costs must come down, and fabricating problems solved before the process industries can take full advantage of titanium's attributes—foremost of which is corrosion resistance.

Despite several years of research and development, and a lot of ballyhoo about its unexcelled attributes for process equipment, titanium is still a rare item in chemical plants. The situation is about to change, however, as production of the metal now exceeds defense and atomic industries' immediate needs.

Titanium mill products (sheet, strip, bar, etc.) have jumped from a few million pounds in 1952 to 10.6 million lbs. last year (*CW, Jan. 19, p. 80*). This year, the figure is expected to hit the 20-million-lb. mark. And the future looks even brighter: Mallory-Sharon Vice-President Frank Vandenburgh estimates that the industry will



be turning out titanium at the rate of 70 million lbs./year by 1960.

To the chemical process industries, expanded titanium output means that the government's two-year-old decree earmarking 10% of total production for nondefense use may finally become a reality. Civilian markets are already beginning to get a trickle of titanium—about 4% of last year's record output. And mill fabricators emphasize that they are driving for these markets, but still face many tough metal-working problems.

Advantages Come High: Just as titanium's high strength-to-weight ratio has made it a natural for the aircraft industry, its inherent resistance to corrosion qualifies it for many chemical applications. It's not, however, a panacea for all corrosion ills; it has a poor record, for example, in handling reducing solutions. But even the most skeptical can't debunk titanium's outstanding record of performance in oxidizing solutions (*see box, p. 29*). In many cases, its success has been phenomenal.

Pioneer-user Du Pont says that in almost every case, titanium equipment is outliving test-lab predictions. Too, titanium has made process improvements possible. Says Jim Mitchell, plant manager of Calera Mining's Garfield, Utah, cobalt refinery: "Without titanium, it would be impossible to operate on a continuous basis." In Calera's autoclaves, where stainless steel letdown valves lasted only a few days, titanium replacements resist corrosion for several weeks.

But these tantalizing attributes aren't easy to come by—titanium equipment is still saddled with a luxury-item price tag. Many a potential user shies away on finding that—to justify the cost—he must squeeze out of titanium many times the service life of his regular equipment.

"With the price what it is today, industry can hardly afford it," said Crane chairman Frank Elliott before the New York Society of Security Analysts, recently. (Crane is Republic Steel's partner in operating sponge-producer Cramet; Crane is also interested in making titanium valves.)

What It Costs: Mill-product cost for titanium is a little more than 15 times that of stainless steel, the metal with which it is most often compared.* But titanium technology is young. As producers and fabricators learn and develop their methods, costs will drop. Titanium is one of the few metals showing steady price reductions (*CW Market Newsletter, Dec. 8, '56*). Prices have been halved in the past five years.

Titanium's high strength-to-weight ratio helps considerably to bring down the 15:1 cost ratio. Only 60% as much titanium on a weight basis gives strength equal to stainless steel—thus, less titanium is needed to do the same job.

And, mill producers point out that fabrication is the biggest cost factor, brings down the over-all 15:1 ratio even more. It's hard to pin down exactly how much, because there are many variables:

- A titanium thermowell may cost three or four times the price of a stainless steel one. The job is mainly one of machining. If it weren't for higher raw material cost and large amounts of valueless scrap, the titanium unit would not have a higher price tag. In an actual case, a stainless thermowell cost $95; titanium, $300.
- A reaction vessel of titanium may cost about five times as much as one of stainless steel. Fabrication requires considerable welding, many forming operations. The opportunity to use cheaper materials for some components, saving titanium for critical places, helps to keep costs down. Actual case: 200-psi. pressure vessel uses 785 lbs. of stainless, bears a delivered cost of $2,400; the same vessel uses only 250 lbs. of titanium (in combination with other materials), costs $12,150 delivered.
- Titanium tubing may cost five or ten times as much as stainless tub-

*Costs vary with shape and with type of stainless steel. Comparison is based on sheet and strip, and 316 stainless is taken as most typical. As of March: 316 stainless, 78¢/lb.; commercially pure titanium, $12.10/lb.

ing. Fabrication probably represents a smaller part of over-all cost than in the two cases above. Small orders and some of the larger diameter work are often done by job shops, which adds to costs.

Titanium's corrosion resistance to . . .

Nitric acid (except red fuming)
Hydrochloric acid (up to 3% concentration)
Sulfuric acid (up to 4% concentration)
Formic acid (except boiling and nonaerated)
Acetic acid (except trichloracetic)
Chloride solutions (except boiling and concentrated aluminum chloride)
Chromic acid
Lactic acid
Hypochlorites
Wet chlorine
Molten sulfur
Chlorinated hydrocarbons
Chlorine dioxide
Aqua regia
Many food products
Reducing solutions with oxidizing agents
Seawater

. . . means longer equipment life

Problem	Result
Mixture of organic chlorides (above 125 F)	impeller and shaft in service over 1 year; high nickel-chrome-molybdenum alloy lasted less than 1 year.
Nitric acid (60% concentration at 480 F, 300 psi.)	condenser "top hat" in service over 2½ years; stainless steel lasted 6 months.
Chlorine dioxide	orifice plate in service over 1 year; best other material lasted 2 weeks. mixer in service over 1 year; stainless steel lasted less than 1 year.
Dilute hydrochloric acid and high velocity steam	steam jet diffusers in service over 4½ years; cast iron lasted 3 months.
Dilute nitric acid and nitrogen dioxide (at 400 F)	thermowell estimated life is 5 years; stainless steel lasted 6 months to 1 year.
Dilute sulfuric acid (1½-2% concentration, plus sulfate concentration of 100 gm./liter, at 350 F and 600-700 psi.)	valves last 45 days to several months; stainless steel lasted a few hours.
Highly corrosive and erosive fluid (at high velocity and 3,000 psi.)	valve lasts 70 days; stainless steel lasted 70 hours.

• A titanium valve may cost nine or ten times more than one of stainless steel because the valve must be machined out of raw titanium bar stock. And that wastes metal. Actual case: 1-in. stainless valve, $35-40; all-titanium valve, $350. For this reason, seats and trim (parts in direct contact with the fluid) are the only parts made from titanium, where possible. This might halve the cost ratio.

Ingenuity Helps: An exception to these typical examples is Chempump's canned rotary pump. One of the few stock items offered in titanium, only the bearings and pump chamber are not titanium. A neat bit of designing keeps the price down to about one and a half times that of stainless steel. "We can actually make it for a little less than Hasteloy B," says Chempump's D. P. Litzenberg.

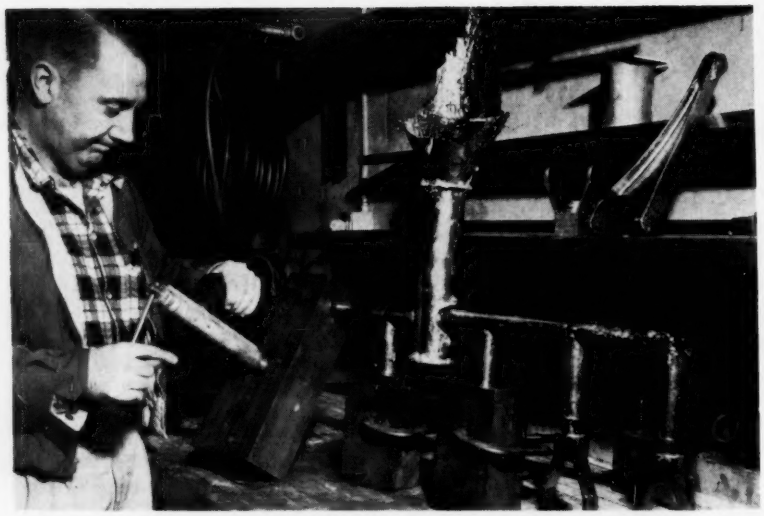
He adds: "The only way you can keep the price out of the precious metal class (and knowing all the time that sales will naturally be limited) is to forget the way you'd make an ordinary pump. Concentrate on how it can be done using the standard shapes available in titanium. That's what we did. And it's what the industry will have to do for a lot of things if it is going to get the benefit out of titanium."

Calera Mining pulled its own rabbit out of the hat, saved by adding to titanium's service life. Not content with an all-titanium letdown valve that increased life to "several weeks" from stainless steel's "couple of days," Calera redesigned the whole valve. The valve is now machined to take a silicon carbide lining (Union Carbide's Refrax-R ceramic) made to Calera's specifications. With the lining insert, Calera has increased valve life from a six-weeks minimum to several months.

It Takes More: So far, design ingenuity hasn't been very effective in keeping most potential users from turning tail at the mention of titanium. Both metal price and fabricating costs must drop appreciably. Fabricating costs could plummet first, now that mill products are to be more plentiful.

Right now, the fabricators' biggest problem is lack of familiarity with the metal. Said one: "Titanium? I don't even know what the metal looks like."

The list of fabricators who have actually done work for the chemical



CASTING at Oremet: 'Internal shrink holes, porosity are headaches.'

industry is not long. But many are currently experimenting with the metal *(see list, p. 32)*.

Titanium has a reputation as a rough customer to handle. It has a high yield strength, compared with ultimate strength. Young's Modulus (measure of elastic strength) is lower than that of stainless steel (probably explained by relatively wide spacing of the atoms and less curvature per unit cell). Forming requires more force (25-30% greater) than stainless steel, and spring-back is twice as great. But low elastic strength means that titanium requires rigid support during working.

Its low thermal conductivity makes it difficult to heat, difficult to properly distribute heat during hot-forming operations. Too, titanium is highly reactive at elevated temperatures. The large space between atoms makes it particularly susceptible to air diffusion. Nitrogen and oxygen pickup causes embrittlement, reduces ductility. Hydrogen produces the same effect.

Reputation Tarnished: As experience is gained in working with titanium, fabricators find the rough-customer reputation quickly fades. Steve Shelton, Oregon Metallurgical's general manager, puts it this way: "Essentially, anything offered in steel or aluminum can be fabricated from titanium."

"All the beginner needs is a little bit of nerve," says Don Macleary, Du Pont metallurgist. Here's what fabricators are finding out:

• Forging—No unusual problems are presented. Forging at the lowest possible temperature (below 1650 F) —in a slightly oxidizing atmosphere to prevent hydrogen pickup—minimizes oxygen surface contamination. Some fabricators do their own forging now, whereas they once farmed it out. Most good forge shops have worked with titanium, are familiar with it.

• Machining—Titanium's high elastic distortion, low thermal conductivity, low density and tendency to gall require the use of sharp tools, correct tool angles, heavy feeds, slow speeds and proper coolants. But, says Autoclave Engineering's Bob Porter: "Titanium is not any easier or harder to machine than copper, stainless or carbon steel."

• Welding—Spot and seam welding may be done without a protective atmosphere. Fusion welding requires complete protection from oxygen and nitrogen. Common techniques: inert arc, argon, heliarc and inert gas chambers. Automatic, consumable-electrode welding handles production operations.

At one time, most fabricators sent work out to special welding shops. Now, many do the jobs themselves. In fact, Kay Industries, an early welder on jobs for Wyandotte Chemical, is now in a position to do complete general fabrication jobs.

• Forming — Room-temperature forming is satisfactory for many shapes. Difficult shapes may require heating to 300-800 F to reduce spring-back and the forming power requirements.

• Deep drawing—This type of forming hasn't been used extensively. But the chemical industry should find it important for pressure vessels, tanks, etc. Room-temperature drawing is a multistage operation, requires intermediate annealing. Single-stage drawing is possible at 800 F, using powdered graphite lubricant.

• Spinning—Like deep drawing, this type of forming hasn't been used extensively, though the chemical industry will probably call for it often. Some shapes can be spun at room temperature.

• Extrusion—Low die costs give extrusion a cost advantage over roll forming. Galling is the main problem. Solution rests on lubricants that can take the extrusion temperatures and pressures.

• Annealing and stress relieving—Annealing at 850 F or higher restores compressive yield strength after forming. An oxidizing atmosphere is most often used. The hard and abrasive oxide surface scale is removed by grinding, grit or vapor blasting, or by molten-salt oxidizing baths, followed by pickling. Turco Products (Los Angeles) has a new two-step immersion process that, it says, eliminates blasting and pickling. And Temco Aircraft (Dallas) has developed an electrolytic process for doing the job.

Problems Push Costs Up: Some of the metal-working conditions are unique. But, in general, the operations

WELDING at Pfaudler: 'Reaction with air causes embrittlement.'

performed aren't unusual, won't hike costs appreciably. It's learning that costs money, causes most problems. Consider, for example, two severe forming techniques pioneered by Lukens Steel:

- The first involved spinning ¼-in. titanium plate to form dished heads. Preliminary pressing required four reheats to 1400 F. Each time, after only 20 seconds of pressing, the temperature had dropped to 1000 F. After a fifth reheat, spinning was started at 1400 F. In two minutes, the temperature had dropped 1,000 degrees. A sixth reheat—this time to 1460 F—followed, and two minutes of spinning again dropped the temperature almost 1,000 degrees. Lowest temperature for severe forming proved to be 400 F; highest safe temperature for heating before physical properties began to be lost was about 1550 F. Spinning had to be performed rapidly, or not at all.
- The second, involving cold-pressing of ¼-in. plate into dished-head shapes 18 in. in diameter with 1 ¾-in. flanges, has just been completed. The dies locked during pressing—even 700-ton pressure failed to free them. It took a complete disassembly to free the head. Cold flow (twice as great as with cold carbon steel), particularly in the direction the plate had been mill rolled, was to blame. Yet, neither the 700-ton pressure nor the extra handling damaged the head.

Biggest Problem: By far, the biggest cost factor plaguing the titanium industry is scrap. Right now, 15-25% is recoverable. Most scrap is worthless, must be charged off to the price of mill product and finished part. Mallory-Sharon's $500,000 pilot plant for electrolytic recovery (*CW Technology Newsletter, Dec. 15, '56*) will be ready to operate by the middle of the year, may go a long way toward solving the problems. Separation of alloying materials, removal of nitrogen, oxygen, etc., are the headaches.

Scrap losses are tremendous, said to run close to 50%. Mills lose huge quantities in grinding, descaling, pickling. And fabricators work the metal under the constant tension of knowing that a mistake can cost the entire piece.

Painstaking planning is the fabricator's solution. At Steel & Alloy Tank, they say that scrap isn't the thing that costs as much as the extreme care in fabricating. Guy Barbolini at Project Fabrication agrees, adds that welds can't be repaired for fear of embrittlement. The only solution is to cut out the entire weld, then weld in an entire new section.

COLD PRESSING at Lukens: 'At first, cold flow made the dies lock.'

Welds have to be 100% X-ray inspected. On some jobs (e.g., nuclear reactor vessels), this is required of any metal fabricating, but with titanium it's a "must" for all jobs. Often, big shapes are radiographed.

No Stock: As experience grows and costs tumble, the fabricator becomes aware of the shortage of civilian titanium. Even items like tubing and fittings can't be bought off the shelf.

Project Fabrication's Barbolini cites an example: A coupling needed to complete a job couldn't be purchased from stock. An order would take several months and the customer couldn't wait. Barbolini had to purchase bar stock, make his own coupling at added expense.

Increased civilian demand, plus increased mill production are the only ways this situation can be corrected.

Mill Problems: The mills are pushing production for civilian markets, but they face cost problems, too. In addition to the scrap problem, five factors keep mill-working costs high:

1—Sponge costs are high, compared with costs of crude forms of other metals.

2—Mill equipment used for forming titanium was originally designed for stainless steel.

3—High development costs must be amortized.

4—Mill operations aren't integrated from melting through to finished mill shape.

5—Mills must work to aircraft specifications.

Sponge prices have dropped to $2.75/lb. from $3.45/lb. a year ago, but are still about seven times those of stainless steel ingot.* So far, sponge processes have been tied to the Kroll batch process and sodium reduction modifications. They have resisted continuous operation, though some say this is a mania rather than a necessity for economic production. They often point to open hearth steelmaking as an example of economic batch processing. The recently announced Allied-Kennecott joint venture is tabbed as based on a continuous process (*CW, Dec. 22, '56, p. 21*). Everyone is waiting to see whether this project will be the first to garner this honor. Result might be an appreciable price reduction.

Proportionally, the biggest cost jump comes during mill forming. It costs more than 23 times as much to process titanium sponge into sheet as it does to process 316 stainless steel from ingot into sheet.

Production figures tell some of the story. About 2,000 tons of mill products were shipped in 1955. Demand reached more than 6,000 tons last year Producers squeezed out 5,300 tons. This year, demand is up to an

*Titanium ingot prices are unavailable. Titanium sponge and stainless steel ingot prices are said to be reasonably comparable.

Who Fabricates Titanium

MILL PRODUCTS†

Titanium Metals Corp. of America, New York
Bars, billets, discs, extrusions, powder, plate, rod, rings, sheet, strip, tubing, wire

Rem-Cru Titanium, Inc., Midland, Pa.
Bars, billets, plate, sheet, strip, tubing, wire

Mallory-Sharon Titanium Corp., Niles, O.
Bars, billets, plate, rods, sheet, strip

Republic Steel Corp., Cleveland
Bars, billets, plates, sheet, wire

Oregon Metallurgical Corp., Albany, Ore.
Ingot, castings*

Harvey Aluminum, Los Angeles
Ingot

Metals Disintegrating Co., Union, N.J.
Powder

INTERMEDIATE SHAPES

American Silver Co., Flushing, N.Y.
Foil

Babcock & Wilcox, Tubular Products Division, Beaver Falls, Pa.
Extrusion

Bridgeport Brass Co., Bridgeport, Conn.
Extrusion, rod*, cladding*

Brooks & Perkins, Inc., Detroit
Spinning, cladding*

Cambridge Wire Cloth Co., Cambridge, Md.
Wire cloth

Chicago Bridge & Iron Co.*, Chicago
Cladding

Clevite Corp., Cleveland
Filters (powdered metallurgy)

Driver Harris Co., Harrison, N.J.**
Foil, wire

General Plate Division, Metals & Controls Corp.*, Attleboro, Mass.
Foil, wire, cladding

H. M. Harper Co., Morton Grove, Ill.
Extrusion, wire*

Hendrick Mfg. Co., Carbondale, Pa.
Perforated sheet

B. H. Hubbert Co., Baltimore
Deep drawing, pressing

C. O. Jelliff Mfg. Corp.*, Southport, Conn.
Wire, wire cloth

Johnston & Funk Titanium Corp, Wooster, O.
Wire, rods, special alloy ingots, special forms

Ladish Co., Cudahy, Wis.
Extrusion*, pressing

Little Falls Alloy Co., Paterson, N.J.
Wire

Lodge & Shipley Co.*, Cincinnati
Spinning

Lukens Steel, Coatesville, Pa.
Pressing, spinning, cladding*

National-Standard Co., Niles, Mich.
Wire

Newark Wire Cloth Co., Newark, N.J.
Wire cloth

Reynolds Metals Co., Louisville, Ky.
Extrusion

Secon Metals Corp., White Plains, N.Y.
Wire

A. O. Smith Corp.*, Milwaukee
Cladding

Roland Teiner Co., Everett, Mass.
Pressing, spinning

Twigg Industries, Inc., Brazil, Ind.
Spinning, general forming

Wisconsin Centrifugal Foundry, Inc.*, Waukesha, Wis.
Casting

Worcester Pressed Steel Co., Worcester, Mass.
Deep drawing, pressing

GENERAL FABRICATION‡

Richard Armstrong Co.*, West Chester, Pa.

Autoclave Engineering Corp., Erie, Pa.

J. Bishop Co.*, Malvern, Pa.

Brooks & Perkins Inc., Detroit

The Budd Co.*, Philadelphia

Buflovak Equipment Division, Blaw-Knox, Buffalo, N.Y.

Matt. Corcoran Co., Louisville, Ky.

Dean Products Corp., Brooklyn, N.Y.
Thermopanel-type heat exchangers

DeLaval Separator Co.*, Poughkeepsie, N.Y.
Involving machining and welding

Dorr-Oliver, Stamford, Conn.
Wet cyclones

The Elliott Co., Jeanette, Pa .
Jet ejectors, etc.

†Mill Products producers are not included in Intermediate Shapes listing, although in some cases they produce wire, tubing, etc.
*Indicates experimental.
**Orders not accepted because of defense contracts.
‡Fasteners: Allmetal Screw Products Co. (Garden City, N.Y.), Camcar Screw & Mfg. Corp. (Rockford, Ill.), Elastic Stop Nut Corp. of America (Union, N.J.), National Rivet & Mfg. Co. (Waupun, Wis.), Pawtucket Mfg. Co. (Pawtucket, R.I.), Pheoll Mfg. Co. (Chicago), Standard Pressed Steel (Jenkintown, Pa.).

Ex-Cell-O Corp., Detroit

Griscom-Russell*, Massillon, O.
Heat exchangers

Hendrick Mfg. Co.*, Carbondale, Pa.

Improved Machinery Co.*, Nashua, N.H.
Pulp and paper mill

Industrial Filter & Pump Mfg. Co., Chicago
General fabrication, heat exchangers*, tanks*

Kay Industries Inc., Detroit

O. G. Kelly & Co.*, Boston

Manning & Lewis Engineering Co., Newark, N.J.
General fabrication*, heat exchangers

Maxim Silencer Co., Hartford, Conn.

Monument Engineering Co., Indianapolis

The Nooter Corp., St. Louis

Joseph Oat & Sons, Inc., Philadelphia
General fabrication, forming and welding of coils

The Pfaudler Co., Rochester, N.Y.

Project Fabrication Corp., College Point, N.Y.

Schutte & Koerting Corp., Cornwells Heights, Pa.
Jet ejectors, etc.

A. O. Smith Corp., Milwaukee

Stainless Products, Inc., Clifton, N.J.

Steel and Alloy Tank Co., Newark, N.J.

Struthers Wells Corp., Warren, Pa.

Sun Shipbuilding & Dry Dock Co., Alloy Fabricating Shop, Chester, Pa.
Equipment components

Trinity Equipment Co., Roselle Park, N.J.
Thermowells

Twigg Industries, Inc., Brazil, Ind.

Universal Match Corp., Ferguson, Mo.

Vulcan-Cincinnati, Inc., Cincinnati

Wall Colmonoy Corp., Detroit

Weisner-Rapp, Buffalo**

Youngstown Welding & Engineering Corp., Youngstown, O.

VALVES and TRIM

Alloy Steel Products Co.*, Linden, N.J.
Seat rings, discs

The Annin Co.*, Los Angeles

Autoclave Engineering Corp., Erie, Pa.

Clevite Corp., Cleveland
Seats and trim (Powdered metallurgy)

Crane Co., Chicago

Duriron Co.*, Dayton, O.

Fabri-Valve Co. of America, Portland, Ore.

H. M. Harper Co., Morton Grove, Ill.
Parts and stems

Hoke, Inc., Englewood, N.J.

ITE Circuit Breaker Co., Philadelphia, Pa.

Minneapolis-Honeywell Regulator Co., Valve Division, Philadelphia, Pa.

William Powell Valve Co., Cincinnati

Project Fabrication Corp., College Point, N.Y.

Youngstown Welding & Engineering Corp., Youngstown, O.

TUBING and PIPING

Babcock & Wilcox, Tubular Products Division, Beaver Falls, Pa.

Bridgeport Brass Co.*, Bridgeport, Conn.

Buflovak Equipment Division, Blaw-Knox, Buffalo, N.Y.

Carpenter Steel Co., Alloy Tube Division, Union, N.J.

The Nooter Corp., St. Louis

Pypon Co., Pittsburgh
Forming but not welding

A. O. Smith Corp.*, Milwaukee

Superior Tube Co., Norristown, Pa.

Swepco Tube, Clifton, N.J.

Trent Tube Co., East Troy, Wis.

Youngstown Welding & Engineering Corp., Youngstown, O.

PIPE and TUBE FITTINGS

Autoclave Engineering Corp., Erie, Pa.

Clevite Corp., Cleveland
Powdered metallurgy

Crawford Fittings Co., Cleveland

Ladish Co., Cudahy, Wis.

Swepco Fittings Corp., Clifton, N.J.

Tube Turns Division, National Cylinder Gas Co., Louisville, Ky.

Welding Fittings Corp., New Castle, Pa.

Youngstown Welding & Engineering Corp., Youngstown, O.

PUMPS and PUMP PARTS

Aldrich Pump Co., Allentown Pa.

Buffalo Pumps Division, Buffalo Forge Co., North Tonawanda, N.Y.

Chempump Corp., Philadelphia

Duriron Co.*, Dayton, O.
Impellers

H. M. Harper Co., Morton Grove, Ill.

Project Fabrication Corp., College Point, N.Y.

estimated 10,000 tons.

Producers are faced with constant growing demand, are dealing with a product that was practically nonexistent 10 years ago. Having to start somewhere, they picked stainless steel mill equipment for the job.

Experience is leading to new equipment designs tailored for titanium. For example, Titanium Metals' Toronto, O., plant is currently being reconstructed as a special forging and rolling facility. Rem-Cru and Mallory-Sharon have new equipment at various stages of development and production.

Crane's Elliott underscored the cost of mill equipment in discussing Cramet's welcoming of Republic Steel as a partner. "Our own melting facilities would have cost $8-10 million. When you talk production of mill products, you are talking about real money."

These tremendous equipment outlay costs, coupled with rapid growth of demand (but still-small tonnage*) have been a deterrent to integration. Sponge may be produced one place, melted into ingots and billets elsewhere, shipped on to another location for production of plate, sheet, strip—intermediate shapes being shuttled back and forth between plants. It has been a case of using mill equipment that is available for the job at a particular time.

Aircraft Specs: The aircraft industry has been the prime mover in titanium's rapid development — CHEMICAL WEEK's Feb. 19, '55, comprehensive report on titanium pointed to a 150,000-tons/year estimate for military aircraft alone. But working to aircraft specifications is expensive. Mills point out that certain specs might be relaxed for the chemical industry without adversely affecting the metal's desirable qualities.

For example, aircraft specs call for grinding both sides of titanium sheet free of surface marks. Specifications for stainless steel require this for one side only. Once the chemical industry's volume is sufficiently large, new specs can be studied.

Aircraft specifications have slowed the development of commercial titanium castings. Occasional voids, shrink holes can't be tolerated in aircraft castings. And titanium just hasn't been available for much experimental casting.

But casting is coming along—Oregon Metallurgical exhibited titanium castings at the recent International Atomic Exposition in Philadelphia. Oremet's Shelton says, "We expect to be in commercial production of titanium castings up to 50 lbs. in weight by July 1."

Wisconsin Centrifugal Foundry has made experimental castings. Interest was high, but there haven't been any commercial takers. Reasons: decisions to use forgings or other forms, instead; or the hope that some cheaper metal might do the job.

This last reason is the one most often received by fabricators after the initial approach on titanium. But there are applications where titanium still works out best. Where the process requires heavy plate, fabricators may soon have a cost factor to swing the odds in titanium's favor. At least five companies are experimenting with cladding of steel.

Chicago Bridge & Iron seems farthest along, says it has successfully produced strongly bonded, ductile titanium-clad steel by its patented Hortonclad vacuum-bonding process.

Lukens Steel holds British patents, has applied for U.S. patents on production of titanium-clad carbon- and alloy-steel plate by rolling. Commercial production is still some distance off.

Combine these developments with the rapidly increasing competition for commercial fabricating jobs and the constant war on production costs, and titanium's day as a leading process equipment material may not be as far off as many think.

*14,500 tons in '56, compared with 500,000 tons for aluminum.

Titanium Sponge Makers

Titanium Metals Corp.—9,000 tons/year by mid '57

Electro Metallurgical Co.—7,500 tons/year

Du Pont—7,200 tons/year by early '58

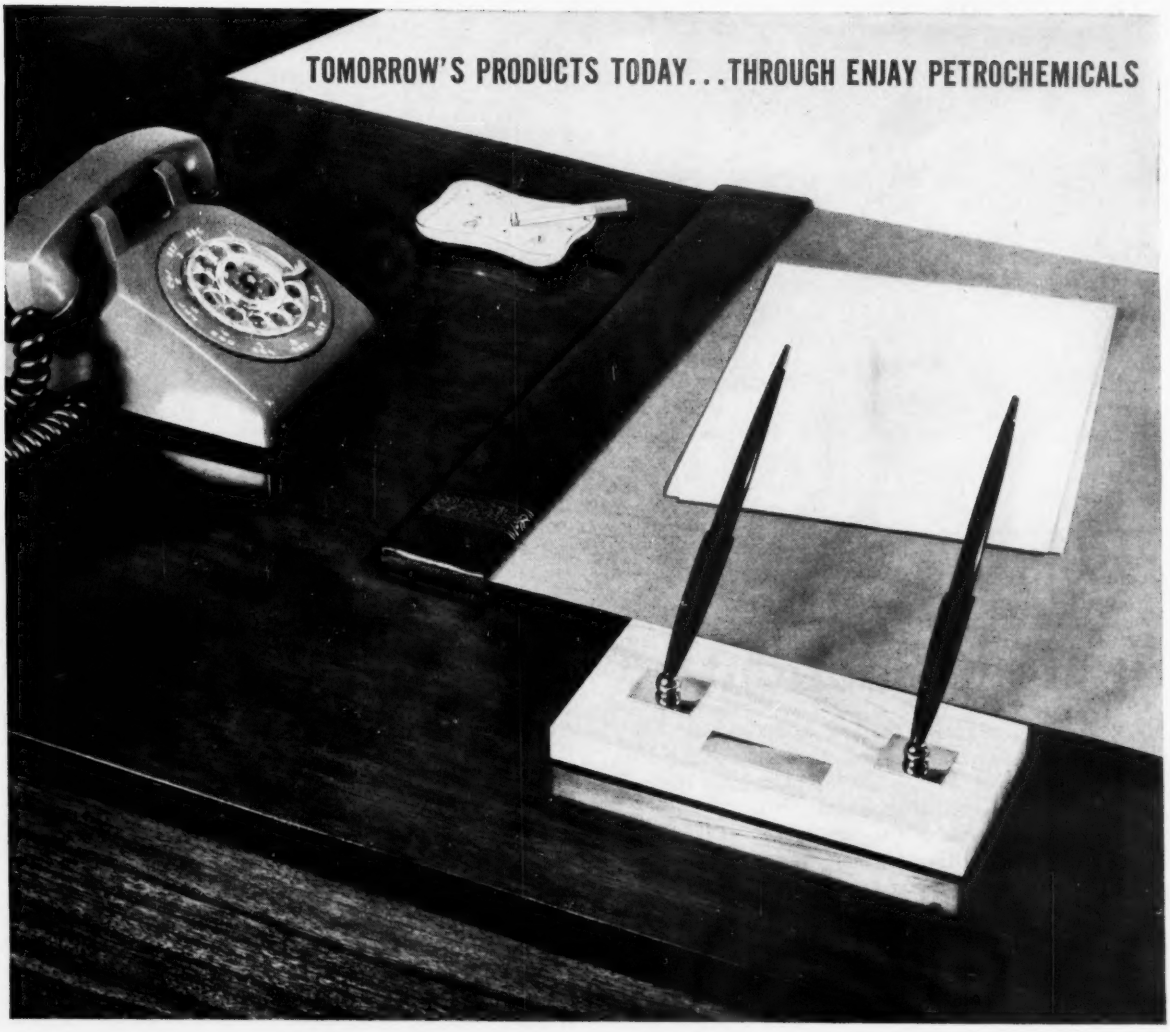
Cramet—6,000 tons/year by the end of '57

Dow Chemical—1,800 tons/year

U.S. Industrial Chemicals*—5,000 tons/year by '58

Allied Chemical & Dye-Kennecott Copper*—6,000-8,000 tons/year (estimated) by end '58

*Not now in production.



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SPECIAL DELIVERY: Five-flatcar train transports 20-story-high ultrafractionation column to Big Spring site in one 110-ton piece.

Tall Towers: Texas-Style Styrene Shortcut

Even by Texan standards, the four 200-ft.-tall ultrafractionation towers dominating the setting of Cosden Petroleum's new $3-million styrene plant must rate as one of the world's tallest shortcuts.

Unveiled last week at Big Spring, Tex. *(CW Technology Newsletter, April 6),* the towering columns are the key to a novel process by which Cosden recovers ethylbenzene directly from gasoline for the production of 20 million lbs./year of plastic-grade styrene. By sidestepping costly synthesis of ethylbenzene (from ethylene and benzene), the new route lowers initial cost of styrene plant to $300/ton of annual capacity.

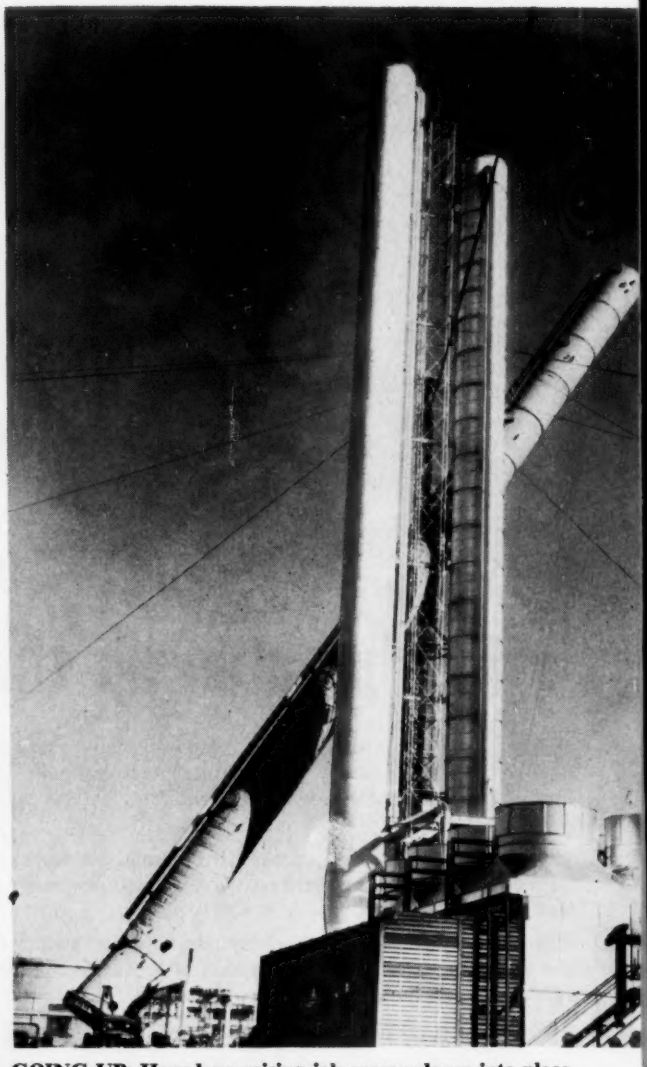
Data Needed: Toughest part of the design job was acquiring precise volatility data on xylene stream constituents. Badger Mfg. Co. (Cambridge, Mass.) came up with the answers, devised the method of splitting materials with a critical boiling point difference of only four degrees.

Badger completed construction of the plant in 13 months. Each of the 110-ton towers was delivered to the site in one piece on a train of five flatcars. Erection of the columns required only one hour for each after it was positioned on gin poles.

Smooth Start: Despite the novelty and complexity of the process, startup in early February was smooth, says Cosden. Product purity was up to 99.2% at the end of the first day's run. And since initial adjustment, the unit has been running with 100% automation.

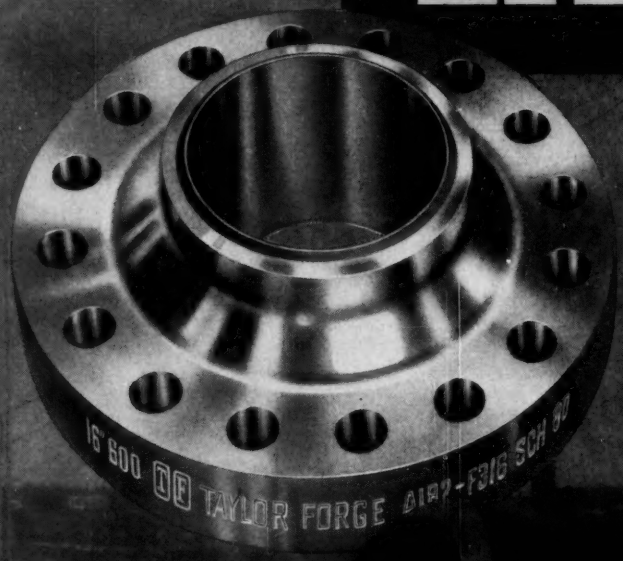
Feed to the separation plant is a mixed xylene stream (containing 15-18% ethylbenzene) from a Udex extraction unit. By utilizing three of the tall towers in series, Cosden has, in effect, a 600-ft. column—the equivalent of 350 plates.

After critical separation, the ethylbenzene is converted into styrene by dehydrogenation with standard catalysts. Product is purified in the fourth column, comes out at better than plastic-grade purity.



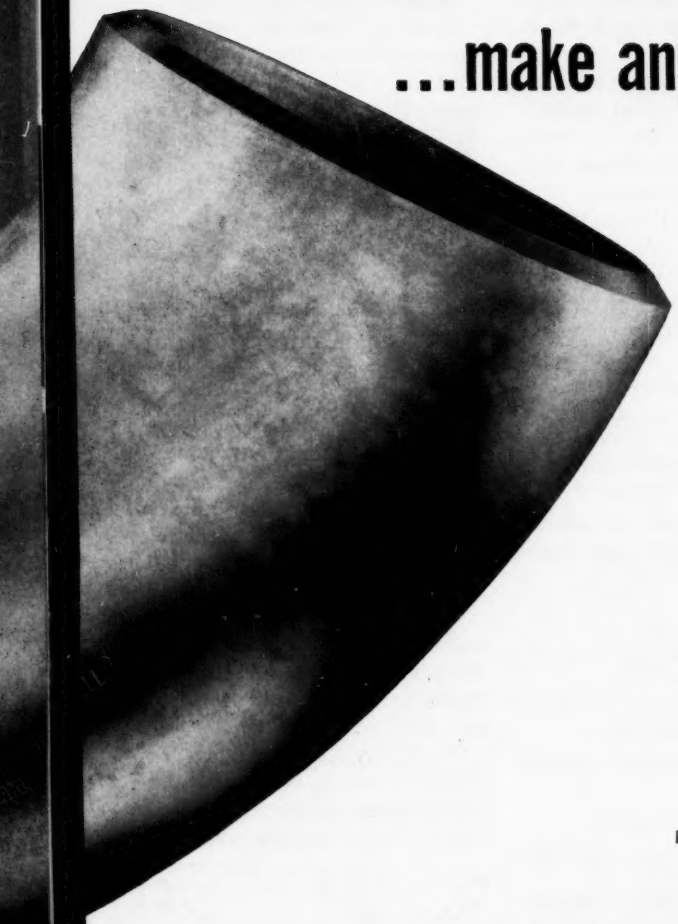
GOING UP: Hour-long raising job eases column into place.

TAYLOR



TF

FORGE Welding Fittings and Forged Flanges



...make any good piping job *better*!

Quality in welding fittings and forged flanges is many things. It is engineering exactitude and manufacturing integrity translated into flawless metal expertly formed, forged, shaped. It's that hard-to-define ingredient which assures dependability . . . always . . . under all conditions. It is something that only experience can produce. And it is the combination of these elements that makes quality conscious buyers

turn to Taylor Forge . . .

TRADITIONALLY DEPENDABLE

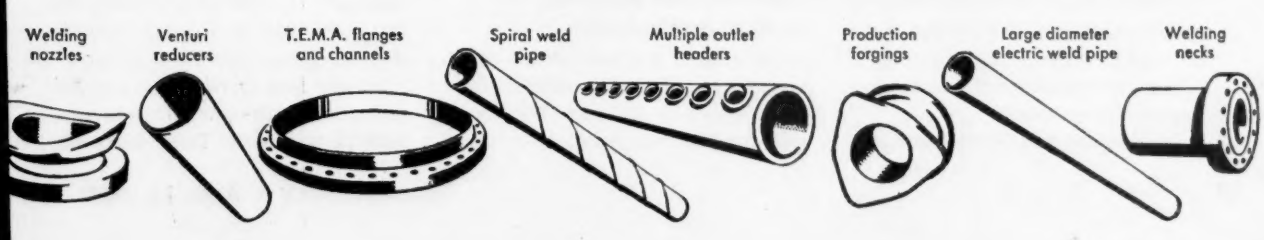
Taylor Forge and Pipe Works

General Offices and Works: P. O. Box 485, Chicago 90, Illinois

Plants at: Carnegie, Pa., Gary, Ind., Houston, Texas, Fontana, Calif., Hamilton, Ont., Canada
District Sales Offices: New York, Boston, Philadelphia, Pittsburgh, Atlanta, Chicago, Houston, Tulsa, Los Angeles, San Francisco, Seattle, Toronto, Calgary.

For Prompt Service . . . See Your Nearby Taylor Forge Distributor

He carries a full stock of Taylor Forge Welding Fittings and Forged Flanges. And he is as near as your telephone. His organization is efficient and reliable and through him you have available the services of Taylor Forge engineers for advice and counsel an any piping problems.



BRIEFS FOR BUYERS

about Caustic Soda • Caustic Potash

Sulfur Chlorides and Oxychlorides

Apparently the Caustic Soda Buyer's Guide fills a need

This pocket-size compendium of useful facts on caustic soda has proved so popular and useful we've ordered a second printing.

Besides much basic information on forms and grades, containers and shipping methods, the *"Guide"* treats of such diverse subjects as these:

- Comparative economics of 50% and 73% liquid caustic soda. An unbiased report on the advantages of both strengths with both a table and nomograph to help you figure quickly if there are any possible savings for you with the 73% liquid.
- The amount of liquid caustic of a given strength you must have to develop various process concentrations. Another nomograph helps you figure your needs in minutes.
- Some points to ponder before you choose a supplier of heavy chemicals.

Get a copy of this second edition for your use. Check the coupon on the next page.

New data sheet on Caustic Potash

We have just completed a data sheet on NIALK® Caustic Potash—one of the newest members of the Hooker roster of chemicals.

We believe you'll find that the new specifications measure up in every way to the high NIALK standards of the past.

If you use caustic potash and purchase other Hooker chemicals such as caustic soda, it might pay you to look into the possible savings of a consolidated source of supply.

You can get NIALK Caustic Potash in standard and low-chloride grades, in 45% to 52% liquid solutions; and in the following solid forms, as 90% and as 85% (low chloride) material: solid, flake, granulated, broken, crushed, powdered, and walnut.

The liquid forms are shipped in tank cars of 4,000 to 10,000-gallon capacity. Solid forms are shipped in steel drums.

To keep your file up-to-date, send for the new data sheet. Just check and mail the coupon.

K_2CO_3 as you like it

No matter how you use carbonate of potash in your processing, you're sure of the *right* form when you specify NIALK Carbonate of Potash.

That's because we make it in these *five* forms:

1. Hydrate regular (granular) 83.5% to 84.0%
2. Calcined regular (granular) 99.2% to 99.6%
3. Calcined powder 99.2% to 99.6%
4. Powder ..... 91.0% to 94.0%
5. Liquid ..... 48% to 52%

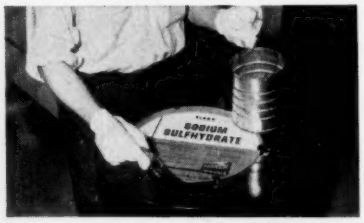
For details on the form that meets your needs best, use the coupon to request technical data.

How long can you store Sodium Sulfhydrate?

A while ago a customer of ours came across some Hooker sodium sulfhydrate which he had stored accidentally for over four years.

It looked OK, so he used it.

Results? "Excellent," says he. No apparent iron contamination in four years!

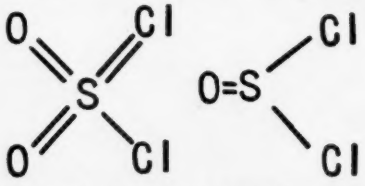


Such long-lived purity is no accident when you buy Hooker sodium sulfhydrate.

We package sodium sulfhydrate in brand-new steel drums with a 1/64-inch lining of lacquer to prevent iron pick-up. We lacquer the drum lid, and secure it with six sturdy lugs so it stays airtight until you break the seal.

Extra caution is used before the sodium sulfhydrate goes into the drum, too. We control raw materials rigidly by using only our own caustic soda and hydrogen sulfide.

That's why you always get a product that dissolves swiftly into pure, sediment-free solutions when you specify Hooker sodium sulfhydrate.



Want to chlorinate or sulfonate?

In many cases you'll find it's easier and safer to work with Hooker sulfuryl chloride or thionyl chloride than with pure chlorine or sulfur.

To our best knowledge, we alone manufacture these chemicals in commercial quantities. Both make ex-

Carbonate of Potash • Sodium Sulfhydrate

Phosphorus Compounds • Chlorobenzenes

cellent chlorinating agents. Either may be used to introduce sulfur or oxygen and sulfur.

Hooker sulfuryl chloride is 99+% pure. You can get Hooker thionyl chloride in two grades—the technical grade is 93% min. pure, the refined grade 97.5% min.

Two simpler chlorinating agents. You can also purchase sulfur monochloride and sulfur dichloride from us. The monochloride (technical grade) has a chlorine content of 52 to 52.5%. The dichloride is 66% chlorine.

Phosphorus compounds . . . you name them

You can now obtain the following Oldbury® brand phosphorus products from us.

These products are new with us. Many of them were first manufactured in this country under the Oldbury trademark:

Elemental phosphorus: white-yellow—P_4 and red—P_X

Sulfides: phosphorus heptasulfide—P_4S_7
phosphorus pentasulfide—P_4S_{10}
phosphorus sesquisulfide—P_4S_3

Chlorides: phosphorus trichloride—PCl_3
phosphorus pentachloride—PCl_5

Phosphorus oxychloride—$POCl_3$

Phosphorus pentoxide—phosphoric anhydride —P_2O_5

Acids: phosphoric acid, ortho—H_3PO_4
phosphorous acid, ortho (phosphonic) —H_3PO_3
hypophosphorous acid (phosphinic) H_3PO_2

Alkyl acid phosphates: $-(RO)_2P(O)OH+ROP(O)OH_2$

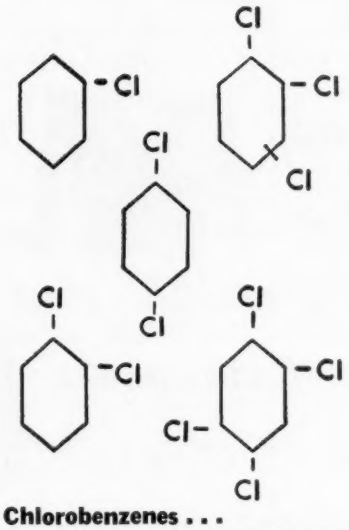
Calcium hypophosphite—$Ca(H_2PO_2)_2$

Potassium hypophosphite—KH_2PO_2

Zinc phosphide—Zn_3P_2

Tetrakis (hydroxymethyl) phosphonium chloride, "THPC"—$(CH_2OH)_4PCl$

For further information on any of these Oldbury chemicals, please write to Hooker Electrochemical Company, Oldbury Products, 19 Rector St., New York 6, New York.



Chlorobenzenes . . . five are Hooker specialties

Whether you use chlorobenzenes as solvents or intermediates, you are sure of finding exactly the right formula at Hooker.

Currently, we are making these five chlorobenzenes as well as dozens of other chlorinated organics and inorganics:

Monochlorobenzene. Solvent and intermediate. Typically 99.5% pure monochlorobenzene as determined by cryoscopic methods.

ortho-Dichlorobenzene, Technical. Solvent, intermediate and heat transfer medium. 85% to 87% pure *ortho*. Major impurity is *para*-dichlorobenzene.

para-Dichlorobenzene. Widely used as insecticide and as sanitary deodorant; also as intermediate. 100% pure. Available in 7 mesh sizes.

Trichlorobenzene, Technical. Used as solvent, intermediate, and as heat transfer medium. Mixture of 1,2,4- and 1,2,3-trichlorobenzene with 1,2,4-predominating.

1, 2, 4, 5 - Tetrachlorobenzene. Solid, usually used as intermediate. Contains 65.7% chlorine.

For more information on any of these chemicals, you can get data sheets listing physical and chemical properties by sending us the coupon.

HOOKER ELECTROCHEMICAL COMPANY
704-1 FORTY-SEVENTH STREET, NIAGARA FALLS, N. Y.

NIAGARA FALLS • TACOMA • MONTAGUE, MICH. • NEW YORK • CHICAGO • LOS ANGELES

HOOKER CHEMICALS PLASTICS

For more information on chemicals mentioned here, check below:

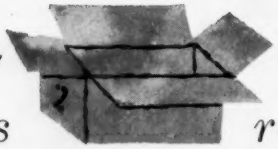
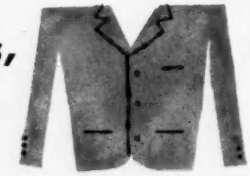
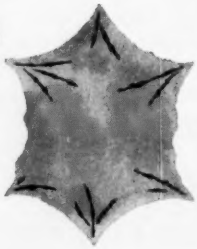
- ☐ *Caustic Soda Buyer's Guide*
- ☐ Caustic Soda (Technical Data Sheets)
- ☐ NIALK Caustic Potash
- ☐ NIALK Carbonate of Potash (Bulletin)
- ☐ NIALK Carbonate of Potash (Technical Data Sheet)
- ☐ Sodium Sulfhydrate
- ☐ Sodium Sulfide
- ☐ Sulfuryl Chloride
- ☐ Thionyl Chloride
- ☐ Sulfur Monochloride
- ☐ Sulfur Dichloride
- ☐ Chlorinating Agents (Bulletin No. 328A)
- ☐ Monochlorobenzene
- ☐ *ortho*-Dichlorobenzene
- ☐ *para*-Dichlorobenzene
- ☐ Trichlorobenzene
- ☐ 1,2,4,5-Tetrachlorobenzene

Clip to your letterhead with your name and title, and mail to us. *When requesting samples, please use business letterhead to help speed delivery.*

EACH NOPCO CHEMICAL MAKES A **PROBLEM OBSOLETE**

NOPCO DETERGENTS

for instance...

In **paper,**  *by keeping felts clean, Nopco detergents reduce shutdowns for cleaning equipment... in* **textiles,**  *they add important economies in raw wool scouring, wool and worsted processing, continuous boil-off operations... makers of* **cleansers**  *find in Nopco detergents a wide range of properties to produce everything from car washes to bubble baths... in* **tanneries,** *a specially developed Nopco detergent removes excess grease from hides, produces better*  *leather.*

These are examples of the *kind* of problem Nopco's research men tackle...with a remarkable proportion of successes. It is always possible that they have recently solved *your* most critical problem. In any event, why not give them a try at it? They'll do their best to give you a practical, profitable answer—soon. Just write Technical Research Dept., Nopco Chemical Company, Harrison, N. J.

1907–1957 50 Years IN PROGRESS IN CHEMISTRY

NOPCO

PLANTS: Harrison, N. J. • Cedartown, Ga. • Richmond, Calif. • London, Canada

Nopco processing chemicals include: Esters, Ethylene Oxide Condensates, Amides, Metallic Soaps, Sulphonates, Water Soluble Polymers, Resin and Wax Emulsions

For: Surface Lubrication • Detergency • Sizing • Plasticising • Softening • Emulsifying • Dispersing • Wetting • Defoaming • Thickening

For complete information see Chemical Materials Catalogue—Pages 373-376

Washington
Newsletter

CHEMICAL WEEK
April 13, 1957

Federal subsidies to help chemical makers find cancer cures will come sooner than expected. The House of Representatives diverted $1.6 million the National Cancer Institute had ticketed for "overhead" items and earmarked it instead for the small-scale launching, by July, of a research program by industrial contractors. At the same time, the institute was directed to draw up a full-scale plan for industrial participation in cancer chemotherapy research along the lines proposed at February's closed hearings *(CW, April 6, p. 104)*, and to include such a program in its fiscal 1959 budget request.

The Senate is sure to go along—and may even boost the $1.6-million starting figure, especially in view of the widespread industry readiness to sign contracts.

•

It's now or never for U. S. approval of the OTC, the Organization for Trade Cooperation, which would supervise world trade agreements. President Eisenhower, rebuffed last year, asked Congress again last week to okay U. S. participation in this proposed international agency. And Rep. Hale Boggs (D., La.) says he'll schedule House Ways & Means Subcommittee hearings on the matter soon.

Boggs sees a better "climate" for possible Congressional approval this year. He warns that delay will dim OTC's prospects—on the theory that protectionist groups are holding their main fire for the 1958 battle over reciprocal trade act renewal. OTC took the brunt of the anti-free-trade attack last year, when other targets were lacking.

•

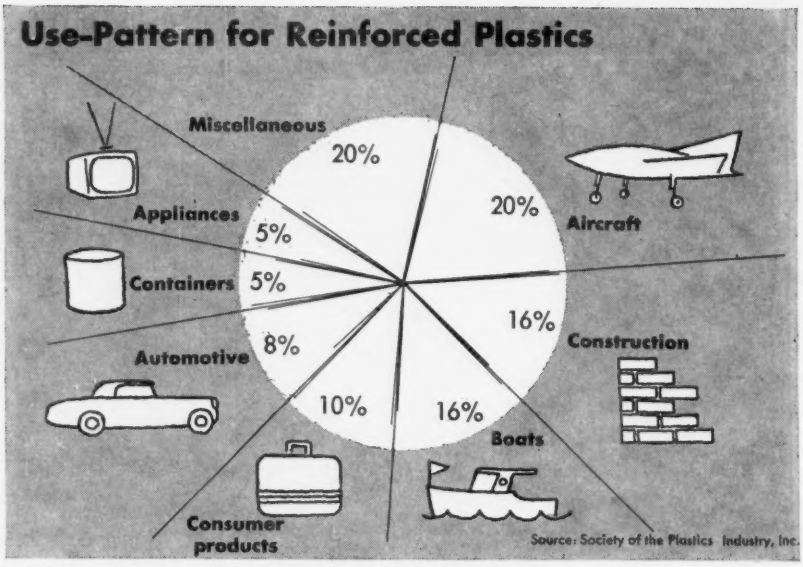
Sinclair Weeks—not U. S. business—is the target of the House Appropriations Committee vote to eliminate funds for all industry divisions (chemicals, among them) of the Business & Defense Services Administration. The committee voted $3,515,000 to BDSA—half of what it got last year—and specified none could be used for business services.

Democratic members are angry at what they regard as economy "double talk" by Commerce Secretary Weeks—saying in public he can get along with less money, but reversing this stand in private testimony to the committee. So the Democrats retaliated by striking at Weeks' most cherished program—and boosting funds for other departmental programs for which Weeks has shown less enthusiasm (e. g., the Patent Office, National Bureau of Standards).

Success of such spite maneuvers is rare. You can look for restoration of much of the BDSA budget cut by the full House. But there's little chance of expanding the BDSA chemical division's chemical market study schedule for next year, as originally planned.

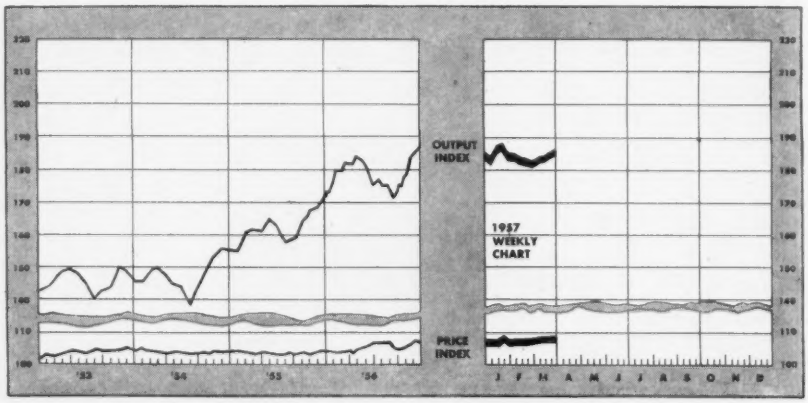
Charting Business

CHEMICAL WEEK
April 13, 1957



Reinforcing Polyester Demand

MORE industries are turning to reinforced polyester plastics to fill specific needs. Some 140 million lbs. of plastics were consumed last year—a 30% jump over the previous year's usage—and spokesmen feel that '57 should see another substantial hike in consumption. The transportation fields are the biggest consumers. Last year, the aircraft industry took 20% of available plastics; boat manufacturers used up 16%; the automotive industry consumed 8%.



Business Indicators

WEEKLY	Latest Week	Preceding Week	Year Ago
Chemical Week Output Index (1947-49=100)	186.3	185.9	183.5
Chemical Week Wholesale Price Index (1947=100)	108.6	108.5	105.7
Stock price index of 11 chemical companies (Standard & Poor's Corp.)	41.94	41.27	52.03

MONTHLY—Foreign Trade (million dollars)	Exports			Imports		
	Latest Month	Preceding Month	Year Ago	Latest Month	Preceding Month	Year Ago
Chemicals, total	102.8	117.1	89.8	21.7	22.0	26.4
Coal-tar products	5.9	9.1	5.8	4.3	3.9	4.4
Industrial chemicals	16.7	19.0	14.9	7.7	6.8	8.5

Put your imagination to work on

PHTHALONITRILE

Commercial production starts this year

This year, Barrett will become the first commercial supplier of phthalonitrile in the U.S. Meanwhile, this valuable intermediate is available for your tests in developmental quantities.

SOME FACTS ABOUT PHTHALONITRILE

1. It's a short cut to the manufacture of phthalocyanine chromogens, widely used as fast green and blue pigments and dyes. They can be made by treating phthalonitrile with copper or certain other metals—a simpler, more economical process than presently used. Phthalonitrile is also a short cut to the manufacture of leuco phthalocyanine precursors used in vat dyeing.

2. Phthalonitrile itself has been suggested for many possible uses, such as a pesticide and (when hydroxylated) as a desensitizer and preserving agent for photographic developers.

3. The structure of phthalonitrile lends itself to coupling with other organic compounds yielding new processes and perhaps important new compounds.

Pick up a pencil and see what you might do with phthalonitrile. For further information, prices, samples or developmental quantities, write us.

Note: This advertisement is printed with phthalocyanine inks made from Barrett phthalonitrile.

Barrett®

BARRETT CHEMICALS

BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N.Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert Street, Montreal, P. Q.

OVER 100 YEARS OF EXPERIENCE

Allied Chemical

CHEMICALS OUTLOOK

April, 1957

This news bulletin about Wyandotte Chemicals services, products, and their applications, is published to help keep you posted. Perhaps you will want to route these and subsequent facts to interested members of your organization. Additional information and trial quantities of Wyandotte products are available upon request . . . may we serve you?

NEW GRADE OF ANHYDROUS CAUSTIC ENDS AGGLOMERATE PROBLEM

A problem that has plagued nearly every user of caustic soda has been that of anhydrous caustic forming large agglomerates after being packaged in drums for shipment.

Here, at last, is an anhydrous grade that solves this problem completely. It's new Wyandotte Flo-chilled Caustic. And it's available now in commercial quantities.

The result of an intensive research program, the exclusive Wyandotte Flo-chilling process locks out moisture during manufacture and packaging; keeps the caustic free-flowing, even during hot, humid summer months . . . a characteristic particularly beneficial to users who employ automatic machinery for repackaging or handling. Other benefits include: dustlessness, and a narrower range of particle size.

Because this unique process virtually eliminates agglomerates, the flowability of Wyandotte Flo-chilled grades of caustic soda is unconditionally guaranteed. These grades are easily identified by a special label on each drum.

Distribution of new Flo-chilled Caustic is being made as rapidly as possible to Wyandotte distributors and to points of storage — along with regular grades of Wyandotte anhydrous caustic, which will continue to be manufactured. For further information, write us direct in care of Anhydrous Caustic Department.

TOUGH, NEW CALCIUM CHLORIDE BAG RESISTS DAMAGE FROM ROUGH HANDLING

Here's good news for users of Calcium Chloride: A new, moisture-proof 100-lb. bag with a nonslip surface. Handling is easier and faster; stacks stay neater, without shifting.

Made of two sheets of 60-lb. basis weight Kraft crepe paper — bonded together with a special asphalt (an improved moisture barrier), and reinforced with glass fibers — these new containers have exceptional tensile strength . . . as proved by drop tests. In these tests, full 100-lb. bags of Calcium Chloride are dropped four feet onto a steel platform, time and time again. After twice as many drops as cause failure of the 5-ply bags previously used, the new bags show no signs of damage or fatigue.

For extra protection against loss resulting from rough handling, ask for Wyandotte Calcium Chloride in the new multi-wall glass-cord-reinforced bag when you order.

Wyandotte CHEMICALS

WYANDOTTE CHEMICALS CORPORATION
WYANDOTTE, MICHIGAN • OFFICES IN PRINCIPAL CITIES

SODA ASH • CAUSTIC SODA • BICARBONATE OF SODA • CALCIUM CARBONATE • CALCIUM CHLORIDE • CHLORINE • MURIATIC ACID • HYDROGEN • DRY ICE
GLYCOLS • SYNTHETIC DETERGENTS (anionic and nonionic) • CARBOSE ® (Sodium CMC) • ETHYLENE DICHLORIDE • DICHLORODIMETHYLHYDANTOIN
CHLORINATED SOLVENTS • *OTHER ORGANIC AND INORGANIC CHEMICALS*

FAR FROM DUTY'S CALL: In venerable hotel, study without distraction.

SHIRT-SLEEVE SESSION: Informality rules at chemical company's own . . .

School for Managers

A temporary school of business administration—set up by Monsanto Chemical Co. as part of a management development program believed to be unique in the chemical industries—next week will graduate its fifth and final class. It then will disband as company executives begin judging its effectiveness, and benefits to the firm.

The Monsanto plan differs from other executive training schemes in that it's more extensive (each course takes three weeks), more intensive (participants are taken clear across the state for a clean break from their regular jobs, devote about 60 hours a week to their studies), and is conducted entirely by "outside" experts (most of the 15 faculty members are professors from graduate business schools, others are management consultants).

When it winds up its operations next week in the small (population 5,890) resort town of Excelsior Springs, Mo. (30 miles northeast of Kansas City), this school will have graduated about 140 of Monsanto's middle-management employees, mostly from the company's main offices at St. Louis. Students' age range was 35 to 60; making up the classes were department heads, executive assistants, plant managers, section heads, research directors and marketing directors.

Long-Term Investment: The 15-week operation of this school—at an estimated tuition-equivalent cost of more than $600/student, aside from participants' salaries and living expenses—is regarded by Monsanto as a "capital investment" in broad-scale managerial education. Principal objectives are all in the long-range category:

- To enable personnel to perform their management functions more effectively, both now and in the future.
- To broaden the perspectives of personnel who—by background and training—are specialists.
- To promote coordination of effort among these managers.
- To improve performance in higher-level assignments that these personnel may have in the future.
- To widen understanding through the commingling of personnel having different job functions and geographical backgrounds.

While emphasizing that the course was not designed for short-range values, A. J. Pastene—the scholarly chemical engineer who manages Monsanto's key employee development program—holds that "the practical nature of the instruction will have benefits immediately applicable to the jobs of many of the students."

Ultimate purposes, Pastene says, "are to aid the participants in handling their current management responsibilities for the good of Monsanto as a whole, and at the same time to encourage and guide their own future growth." Immediate benefits, according to the firm's personnel develop-

NO SPARE HOURS: In 3-week course there's time for eating, none for play.

ment manager, E. W. Burr, will come from the students' use of the principles learned at Excelsior Springs to test and judge their own operations when they return to their jobs.

Detached Viewpoint: Not only are the students taken to a non-Monsanto environment and tutored by a non-Monsanto faculty; their courses' subject matter also is non-Monsanto in nature. Just as it was felt that the detachment of outside instructors would best implement the objectives of the program, the courses' content is not based on studies of Monsanto's own operations. Instead, management approved a curriculum built on a broader framework of business theory and practice, titled "A Look at the Techniques of Management."

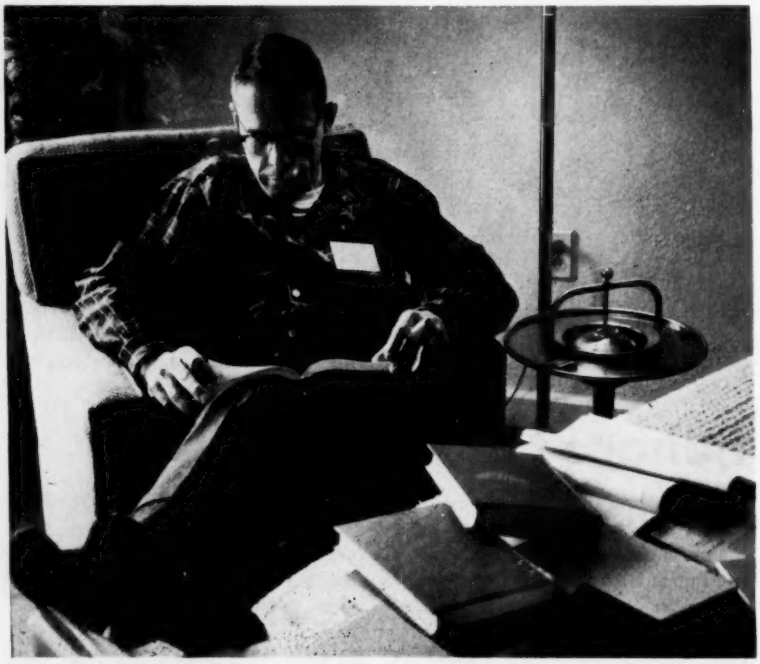
Instruction is in four fields: "effective administration," "accounting as an aid to management," "marketing methods and problems," and "economic background for management decisions." Subject matter for each of these classes was designed especially for the Monsanto program. For example, "effective administration" includes instruction in the fundamentals of dealing with people and in building an effective organization team. This is the point of departure for a study of the place of organized labor in industry.

Instruction is in the form of lectures, with students expected to take down a great deal of information in notes; and discussion classes employing such educational devices as "buzz sessions," "role playing" and "incident" problems. Slide films, motion pictures, charts and other visual aids are utilized. Instructors have complete freedom to use teaching methods of their own selection. There are about 35 hours of class sessions each week, and about three hours/day of homework.

Extension Course Considered: While Monsanto is not planning to continue the three-week school after next week's commencement, an extension course—offering "postgraduate" instruction for employees who have completed the three-week course—is being contemplated, possibly for 1958. And it's possible that the three-week course may be given later for a new crop of middle-management men.

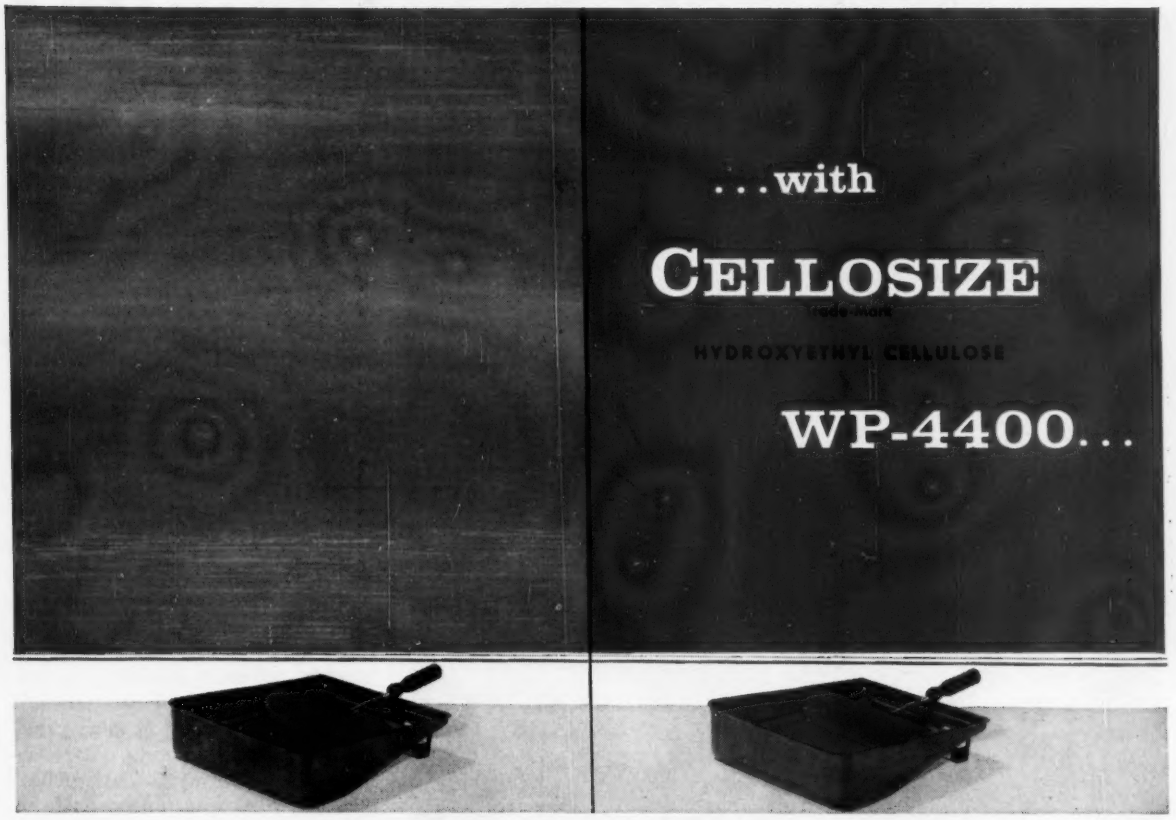
Tentatively, "apparently successful" is the only judgment being passed on the current program by the men in charge of it: Francis Curtis, vice-president for personnel; William Russell, director of the course, formerly director of sales for Monsanto's Organic Chemicals Division and an earlier participant in the advanced management program of Harvard's Graduate School of Business Administration; Horace Tubbesing, assistant director, previously director of personnel relations for the company's Consumer Products Division; and Pastene and Burr.

That judgment is affirmed by two other sources: Monsanto employees who've completed the course, and other companies' executives who've been showing interest in adapting the plan for their own use.



NIGHTLY HOMEWORK: Each evening, about 3 hours of required reading.

What a difference in latex paints . . .



Nonionic CELLOSIZE WP-4400 gives clean, bright colors with minimum sheen variation.

a new, nonionic, water soluble thickener

Your search for an excellent, nonionic, water soluble thickener for latex paints is over. The answer: CELLOSIZE Hydroxyethyl Cellulose WP-4400, a free-flowing, white powder. Its viscosity in 2% aqueous solution—3500-5000 cps. Look at the added advantages you get with this excellent thickener—

In Production

- *Goes into solution readily at room temperature—this saves you time and money*
- *Stability in presence of dissolved salts is outstanding*
- *Reduces foaming in mixing kettle*
- *Contributes to mechanical, freeze-thaw and viscosity stability*
- *Won't gel at elevated temperatures*

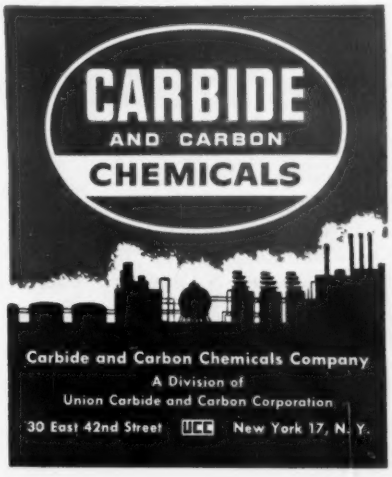
In Application

- *Contributes to better scrub resistance and washability*
- *Improves brushing, leveling, and flow-out*
- *Gives excellent color values, especially with popular deep decorator colors*
- *Reduces sheen variation*
- *Reduces pinholing*
- *Helps improve hiding power*

Now is the time to get your samples and technical data. Write to Carbide and Carbon Chemicals Company, Room 328, Dept. H, 30 E. 42nd Street, New York 17, New York.

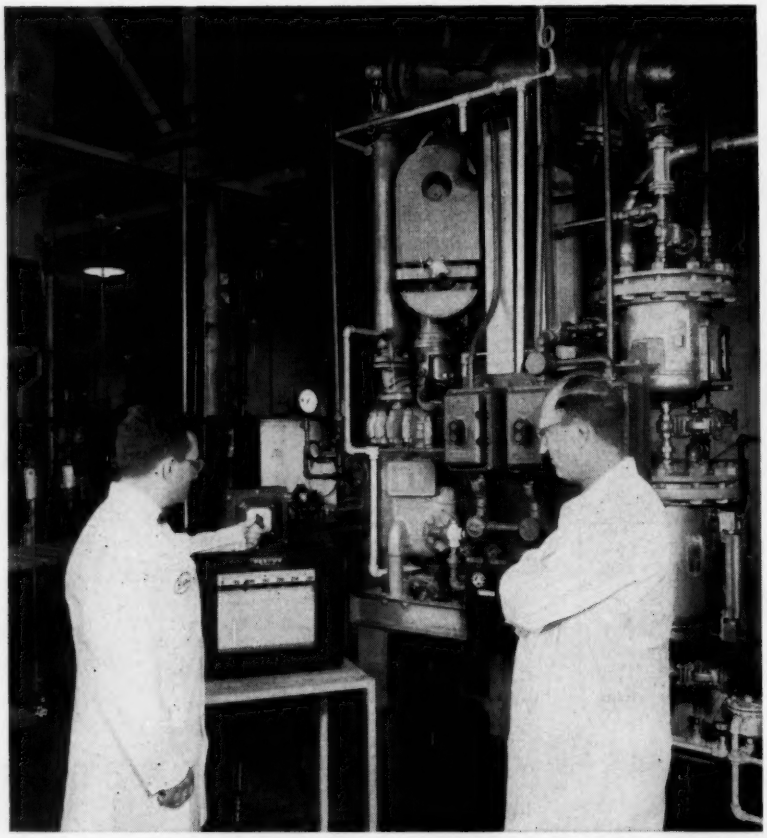
In Canada: Carbide Chemicals Company, Division of Union Carbide Canada Limited, Montreal and Toronto.

The term "Cellosize" is a registered trademark of UCC



Pfaudler

Pfaudler Corrosioneering News Published by The Pfaudler Co., Rochester, N.Y.



Pilot Plant Spans Pharmaceutical Operations— Almost any operation in pharmaceutical manufacture can be performed in this new 4 x 9 x 2½-ft. pilot plant unit designed for Lakeside Laboratories, Milwaukee, by Pfaudler. It can reflux, react, distill and handle quickly a host of functions. High-vacuum distillation is done at as low as 50 microns Hg absolute pressure.

Unusual pilot plant assembly steps up Lakeside's synthetic work

"Virtually all pilot plant operations in pharmaceutical chemistry can be performed in a single new compact assembly specially designed for Lakeside Laboratories, Inc.," states Joseph N. Jacques, plant engineer.

The assembly, part of the expanding synthetic chemistry division, was made to Lakeside specifications by Pfaudler. It requires a floor space of only 4 feet by 9 feet by 30 inches.

It can reflux, react, distill and handle quickly a host of physical and chemical functions. The new unit is particularly noteworthy because high vacuum distillations are achieved at as low as 50 microns Hg absolute pressure.

Made entirely of Type 316 stainless steel, it will handle most of the organics used in Lakeside's products. It is presently used for distilling N-Ethyl-3-Hydroxypiperidine.

All of the initial synthetic work is concentrated on the production of antispasmodics, produced under the trade names of "Dactil," "Piptal," and "Cantil." The staff has found the equipment fast, versatile and easy to manipulate, Mr. Jacques said. The unit can be used for small-scale pilot plant operations as well as full-scale production.

New low-cost corrosion-resistant "Chemstors" get wide usage

Since the introduction of the low-cost Pfaudler glassed steel "Chemstor," companies in various industries have found it the answer for storing corrosive liquids.

A quick analysis of usage reveals successful handling of such products as chlorine dioxide, chlorosulphonic acid, polyvinyls, hydrochloric, nitric, and sulphuric acids in various concentrations, distilled and potable water and a host of inorganics which were not specified. Pfaudler glass prevents product contamination and assures easy cleaning.

"Chemstors" are available in both horizontal and vertical design. Sizes range from 750 to 35,000 gallons and *cost as low as 25¢ per gallon,* depending, of course, on size and service requirements.

Flanged nozzles, in sizes from 3″

Beginning of "Chemstor" tank farm. The more of these low-cost glassed steel storage tanks you use, the greater your product protection and ease of cleaning.

Corrosioneering News

Quick facts about services and equipment available to help you reduce corrosion and processing costs.

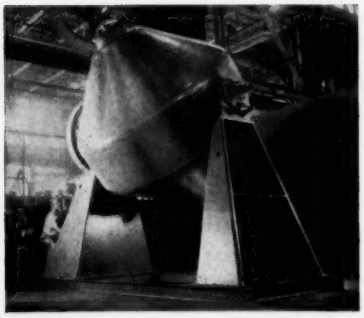
I.D. up, are provided as required. The standard manhole is in the shell at the top of horizontal tanks and in top head of verticals. Both are 12″ x 16″. The manhole cover is flat and glassed on the inside.

You can drastically reduce your storage costs with these dependable Pfaudler "Chemstors" because of: (1) low initial cost, (2) greater product protection, (3) easier cleaning. Bulletin 918 gives you all the facts.

Amazing test results with glassed steel dryer-blender

On test at one of the nation's leading pharmaceutical companies recently, the new Pfaudler glassed steel blender (patents applied for) came through with flying colors on several organic products.

The most difficult test, which was done first, involved a material



One of the biggest so far — 255 cu. ft. When fully charged, this giant blender weighs approximately 20,000 lbs. The heavy-duty gear drive tumbles bucket at 8 RPM with a 15 HP motor. Unit is provided with a magnetic brake, giving you instant and positive control.

with the consistency of whipped cream. Results were amazing and *proved that one Pfaudler dryer-blender could be used to dry seven to ten different products, replacing three conventional tray dryers of 100 trays each!*

The manufacturer immediately placed an order for a six-foot dryer-blender on the spot. Results like these speak for themselves.

You get more than just a dryer with any Pfaudler unit—you get a dryer-blender which gives you these important advantages: high heat transfer, lower power requirements, corrosion resistance, uniform drying and blending. You are invited to test your products in our laboratory test blender at any time, sending your own men along to observe results, if desired. Or, if preferred, Pfaudler will arrange to send a field unit to your plant. Just contact your nearest Pfaudler office or write direct.

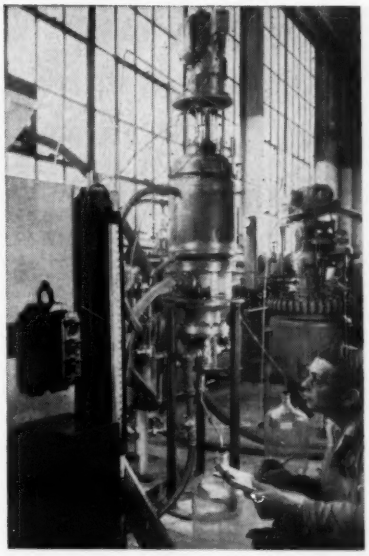
Purer distillates from new Pfaudler wiped-film evaporator

Pilot plant test unit now available

A substantial number of two-inch Pfaudler laboratory-type wiped-film evaporators are already in use on products ranging from volatile solvents to heavy oils and fats. Results to date indicate high efficiency in obtaining pure distillates. Product quality has been particularly improved on such counts as clarity, odor and color.

Send for questionnaire

To help you further evaluate the advantages of high-vacuum distillation for your products on a pilot plant scale, Pfaudler has equipped its testing laboratory at Rochester



Ready to test your products—Now you can check all the advantages of vacuum distillation before investing in equipment. Product purity, faster production and increased profit are among the advantages you may gain.

with the 12″ unit shown above. Please write for a copy of our data questionnaires – forms number 23 and 24. It is, of course, essential for us to know what the physical and chemical properties are in order to determine the feasibility of testing your material.

You can obtain the questionnaire by using the coupon below. Information on the equipment itself is contained in Data Sheet 39, also available on request.

THE PFAUDLER CO., DEPT. CW-3, ROCHESTER 3, N.Y.

Please send me the following: ☐ Wiped-Film Evaporator Questionnaires — 23 and 24 ☐ Wiped-Film Data Sheet 39 ☐ Chemstor Tanks, Bulletin 918 ☐ Dryer-Blender Data Sheet 26 ☐ Stainless Steel Equipment, Bulletin 944.

Name.....

Title.....

Company.....

Address.....

City..... Zone..... State.....

Heavy Chemical Production In Communist Satellites
(in thousands of metric tons)

Country	Year	Sulfuric Acid	Caustic Soda	Soda Ash	Nitrogenous and phosphorous fertilizers
Poland	1937*	267	23	n.a.	n.a.
	'49	276	58	162	148**
	'55	449	101	210	284**
	'60	768	660		585**
Czechoslovakia	1937	166	n.a.	n.a.	71**
	'48	215	37	n.a.	91**
	'55	384	n.a.	n.a.	159**
	'60	560	n.a.	n.a.	298**
Hungary	1938	40	3	n.a.	16**
	'49	49	8	n.a.	30**
	'55	124	12	n.a.	40**
	'60	200	41	n.a.	150**
Romania	1938	44	12**	35	3
	'50	52	15**	54	5
	'55	92	n.a.	80	80
	'60	210	n.a.	n.a.	360
Bulgaria	'55	21	3	74	100
	'60	150	n.a.	125	600

*prewar boundary
**pure content
Source: United Nations, Polish and Czechoslovakian five-year plans, National Bank of Hungary, various East European economic publications, all as reprinted in *East Europe* magazine.

Satellite Chemicals Lag

Communist satellite countries in Eastern Europe continue to push for major production increases in heavy chemicals, but latest statistics reveal that these nations are failing to gain even a step on their U.S. counterparts.

In most satellite countries (*see table*), heavy-chemicals output has increased, and current five-year plans set optimistic goals for 1960. Still, these nations have been able to attain only a small percentage of U.S. production. Sulfuric acid output in Communist East Europe, for example, was 7.2% of U.S. production in '55. Caustic soda output for the same period was but 2.5% of U.S. yield, and soda ash produced in the satellites was 8.5% of U.S. tonnage in '55.

Foremost among the satellites, chemically speaking, is Poland, which before World War II produced a wide variety of basic chemicals.

Poland's six-year plan ending in '55 called for a 240% increase in gross chemical industry expansion. Sulfuric acid output was to have increased 96%; caustic soda, 179%; and soda ash, 140%, according to the magazine *East Europe*.

But the plan fell far short: sulfuric acid production was 17% below the goal; caustic soda and soda ash fell short by 38% and 46%, respectively.

Under the current five-year plan (1956-60), Poland's chemical industry expansion is supposed to be second only to that of the machine industry.

According to the magazine *East Europe*, satellite chemical production has often been forced to give way to items considered more crucial for industrialization. The new economic plans therefore seek to correct that imbalance by calling for even greater chemical production goals.

FISH EYES are OK for FISH

But if "FISH EYES" caused by undissolved particles ARE A PROBLEM IN YOUR PRODUCT then a look at ESCAMBIA PVC 1250 may suggest an answer. This is Escambia's new straight PVC Resin with excellent processing characteristics INCLUDING freedom from "Fish Eyes." Another plus is Improved Heat Stability with its advantages in quality control.

Other new resins include:

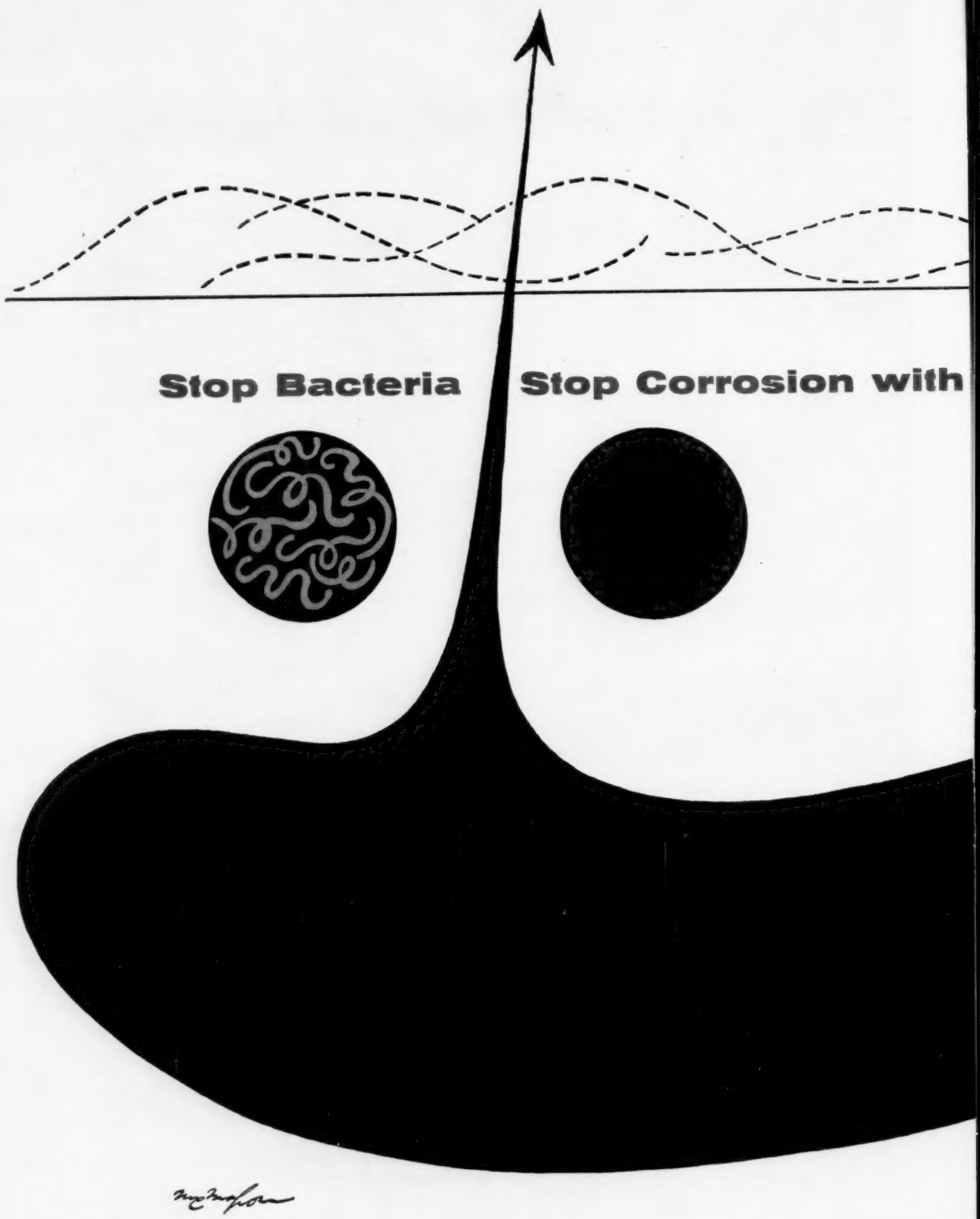
ESCAMBIA PVC 1225—intermediate molecular weight resin particularly adapted for supported and unsupported sheeting.

ESCAMBIA PVC 1200—low molecular weight for flexible and rigid sheeting.

For additional information about Escambia's new resins—write the address below on your letterhead—

ESCAMBIA CHEMICAL CORPORATION

261 MADISON AVENUE • NEW YORK 16, N. Y.


Stop Bacteria
Stop Corrosion with

Reports from engineers in the field show: Armour polar organic chemicals give 99.5% corrosion protection, and *complete* bacteria control—in concentrations as low as 6 ppm!

This remarkable record of success is a direct result of polar organic ability to be adsorbed continuously on metallic surfaces, forming a durable barrier against corrosive attack.

Equally important, they also adsorb on the surface of micro-organisms, disrupting the metabolic processes—particularly on the sulfate reducers, pseudomonas, iron and sulfur-forming types.

By using these Armour chemicals, your injection rates and pressures stay constant. Your equipment lasts longer.

Armour makes a series of polar organic inhibitors designed to solve specific problems. Look below for one to help you.

Armac® CD-50 (Distilled coco amine acetate salt, 50% active). A corrosion inhibitor-bactericide for water systems, this chemical has been proved effective in high brines or fresh water systems.

Duomeen® CD-50 (Distilled coco aliphatic diamine, 50% active). An extremely effective bactericide, but also an excellent corrosion inhibitor.

Duomeen CDA-50 (Distilled coco aliphatic diamine adipate salt, 50% active). An excellent bactericide and corrosion inhibitor that has found application in systems where carbon dioxide and oxygen corrosion are a problem.

Arquad® T-2C (Mixed monoalkyl and dialkyl quaternary ammonium chloride). A corrosion inhibitor and bactericide especially effective in low brines and fresh water systems.

Duomeen T (Tallow aliphatic diamine). An effective intermediate chemical for those who desire to formulate their own corrosion inhibitors or bactericides.

Duomeen TDO-50 (Liquid) (Tallow aliphatic diamine dioleate, 50% active). An easy to use, oil soluble, water dispersible down-the-hole corrosion inhibitor also being utilized to inhibit corrosion in salt water disposal systems and in producing wells.

Duomeen TDO (Fluid paste) (Tallow aliphatic diamine di-oleate). 100% active, oil soluble corrosion inhibitor.

Armour Chemicals Solve Refining Problems

Armour's line of polar cationic surface-active agents are being widely used in refineries to solve both operational and product problems.

The Armeens® and Duomeens® are typical of the Armour cationics that have resulted from laboratory and field evaluations. These materials and their derivatives are used in:

- *Controlling corrosion in processing equipment and finished product storage.*
- *Improving wear properties and acting as acid scavengers in lube oils.*
- *Inhibiting or solubilizing sludge formation in refinery products. . . . Stabilizing color . . . Improving filterability . . . Preventing fouling in equipment.*

For application information, product data, samples and treatment procedures, mail the coupon below.

. . . ARMOUR CHEMICALS FOR OIL PRODUCTION

ARMOUR

Leader in Progressive Fatty Acid Chemistry

ARMOUR CHEMICAL DIVISION
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NEW INFORMATION! HOW TO INCREASE PRIMARY AND SECONDARY OIL PRODUCTION! CW 4

☐ Send me booklet "Armour Organics For Increased Oil Production."

☐ Samples of _____ (fill in chemical desired)

☐ Application information on _____

☐ Treatment procedures for _____

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

Armour Chemical Division • 1355 West 31st Street • Chicago 9, Ill.

WIDE WORLD

JUDGE BICKS: Stiff penalty for juggled records.

LEGAL

Canadian Antitrust: Canadian chemical companies—as well as U. S. parent firms with Canadian subsidiaries—are anxiously awaiting a decision by Canada's Supreme Court in a test case of the Dominion's anticombines law.

The case—based on an appeal by a group of fine-paper mills against a conviction under the Combines Investigation Act—is of particular significance, because Canada's Federal Justice Minister has said that the anticombines legislation will be reviewed or double-checked if the prosecution loses the case.

The Supreme Court in Ottawa is expected to decide whether "substantial elimination of competition constitutes injury to the public under the anticombines legislation."

•

Thermoid Case: A former chairman and president of Thermoid Corp., Frederick Schluter (Trenton, N. J.), has been given a seven-year suspended sentence and fined $40,000 plus court cost of approximately $10,000 for allegedly juggling financial records. Schluter was accused of causing false financial statements of Thermoid to be filed with the New York Stock Exchange for 1951, '52 and '53, and of conspiring to evade corporation taxes for those years.

As a probation provision, Federal Judge Alexander Bicks ordered Schluter to divest himself of all Thermoid stock by April 30.

IDEAS

Schools and Seminars: Managerial and administrative training is offered in numerous conferences, schools and seminar programs scheduled over the next few months. Among those of particular interest to chemical process management:

- Special conference on systems planning and control, sponsored by American Management Assn.—New York, April 25-26.
- Conference on personnel security problems in U. S. industry, sponsored by New School for Social Research—New York, April 25.
- Courses on linear programing, statistical measures for decision making, electronic data processing, etc., sponsored by Operations Research Institute—Princeton, N. J., May 6-Aug. 9.
- Electronic data processing for business and industry, sponsored by Canning, Sisson and Associates—New York, May 20-24.

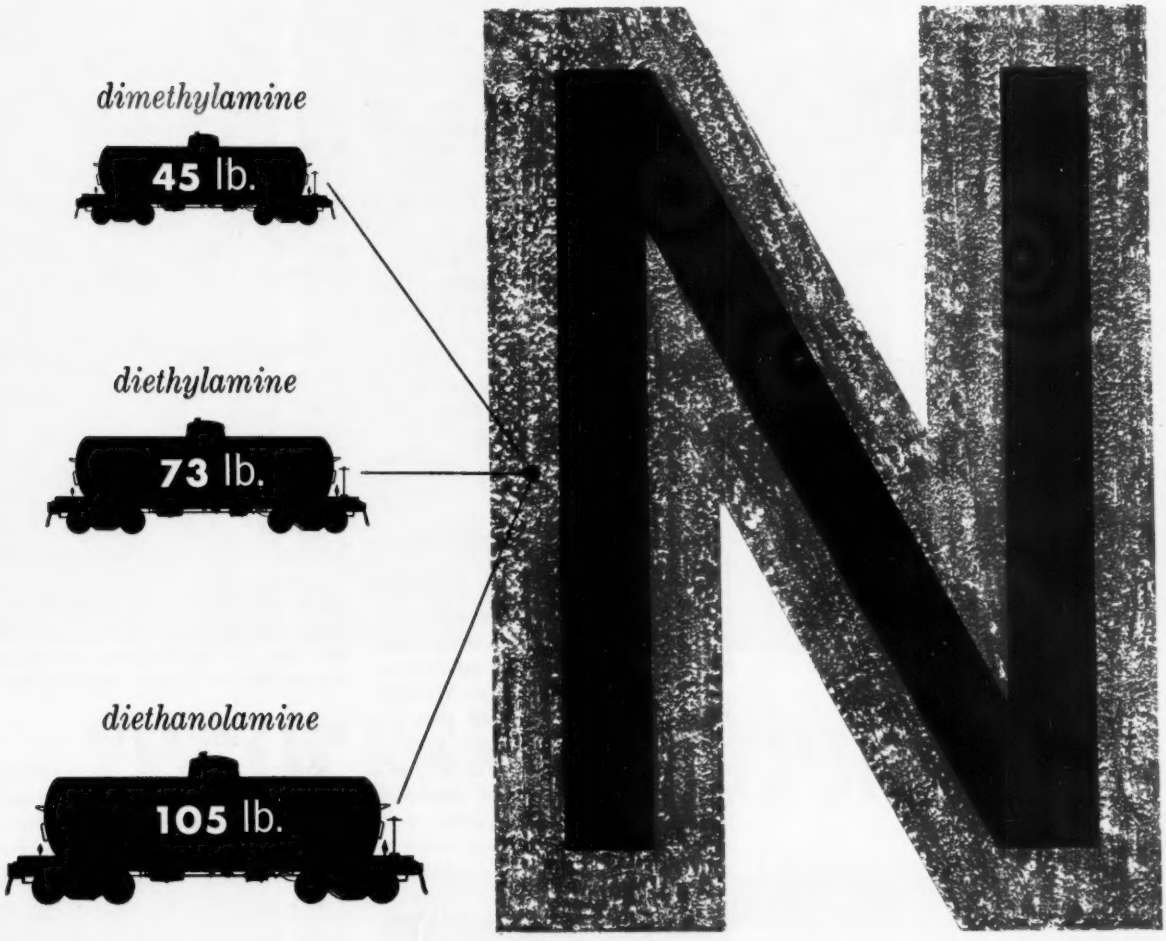
In addition, American Management Assn. expects to initiate in August a decision-making course in which the hypothetical results of each decision will be computed rapidly by an electronic data processing machine and promptly fed back to the decision maker.

•

New Divisions: Rising importance of overseas business to U. S. industry is seen in moves by two process companies—Witco Chemical (New York) and Warren Petroleum (Tulsa)— to set up international divisions. Both new branches will be headquartered in New York. Witco's international division will be responsible for sale and manufacture of all company products outside the U. S., as well as all the company's foreign licensing arrangements. Warren Petroleum International Corp. will specialize in supplying liquid propane and other light hydrocarbons from overseas sources to markets outside the U. S.

In other organizational changes, Great Lakes Carbon Corp. (New York) is consolidating its Dicalite and Perlite Divisions into a new Mining and Mineral Products Division; and Swift & Co.'s Industrial Oil Dept. will be renamed the "Technical Products Dept.," with a wider scope including industrial chemicals, inhibitors, esters and feed additives.

WEIGHTS OF AMINES SUPPLYING EQUAL AMOUNT OF ORGANIC NITROGEN



METHYLAMINES your low-cost source of basic nitrogen

This comparison of dimethylamine with other amines proves a point that also holds true for monomethylamine or trimethylamine. With their low equivalent weights, Rohm & Haas methylamines supply organic nitrogen at substantially lower cost.

In addition, Rohm & Haas methylamines lend themselves to such a variety of reactions that their cost advantage may be utilized in many products. For example, they can be used as intermediates for producing rubber-vulcanization accelerators, herbicides, photographic developers, pharmaceuticals, quaternary ammonium salts, and surface-active agents. All Rohm & Haas methylamines are available in either aqueous or anhydrous form—in drums, cylinders, or tankcars. Write to Dept. SP for complete data.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

LABOR

OCAW on the March: It appears that of the AFL-CIO's two groups in the chemical process field, the Oil, Chemical & Atomic Workers Union is moving faster and more aggressively in the jointly planned organizing campaign than the International Chemical Workers Union. OCAW—which last month started efforts to organize Du Pont workers at Belle, W. Va., and succeeded in winning over most of the Wyandotte employees in Michigan—is now wooing Union Carbide employees at Institute, W. Va., and Spencer Chemical employees at Vicksburg, Miss. ICWU broke even in two recent elections at Niagara Falls, Ont. It won, 41 to 23, in a poll of workers at Strategic-Udy Metallurgical & Chemical Processes Ltd., then failed, 174 to 290, to wrest a North American Cyanamid bargaining unit from the United Electrical Workers (Ind.).

•

New Labor Laws Likely: Public opinion, stirred by the investigations of the special Senate committee headed by Sen. John McClellan (D., Ark.), is likely to support the passage of new federal and state labor laws.

Secretary of Labor James Mitchell, for example, has revealed that the Eisenhower Administration is keeping an eye on the McClellan committee's hearings with the idea of tightening up governmental safeguards over union funds. The unions are trying to clamp down on corruption, Mitchell says, "but they may need some help from the government."

One other area in which Congress may do some legislating during the next year or so is the matter of jurisdiction over certain labor disputes. Three recent U.S. Supreme Court decisions bring out the fact that quite a number of establishments are not being served by the National Labor Relations Board and—because of their position in interstate commerce—aren't eligible for service by state labor agencies. The high court suggests that Congress and/or NLRB try to straighten out this situation.

•

Silver Lining Dept.: Leaders of Engineers & Scientists of America say they see "a promising sign" for their organization in the recent decision by Minneapolis-Honeywell engineers to break away from ESA and affiliate instead with the United Auto Workers (AFL-CIO). ESA President Joseph Amann holds that this move shows that some kind of collective bargaining is needed by professional and technical employees. The only question left for the professional employee, Amann says, is, "Which organization?"

WIDE WORLD

SECRETARY MITCHELL: Unions may need help from the government.

KEY CHANGES

Sydney Thayer, Jr., to president; **Edmund Rowland,** to vice-president; and **Edward C. Page, Jr.,** to secretary-treasurer; Henry Bower Chemical Mfg. Co. (Philadelphia).

J. T. Dunn, to assistant to the director of research, Carbide and Carbon Chemicals Co., a division of Union Carbide and Carbon Corp.

Frank J. Drago, to sales manager, Sheffield Chemical (Norwich, N.Y.).

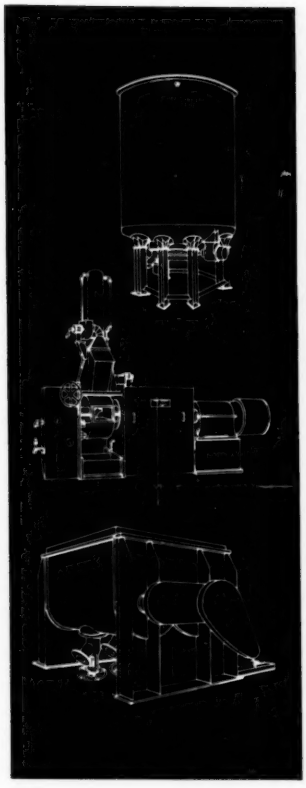
Thomas L. Apjohn, to manager, Petroleum Chemicals Dept., Mobil Overseas Oil Co., an affiliate of Socony Mobil Oil Co.

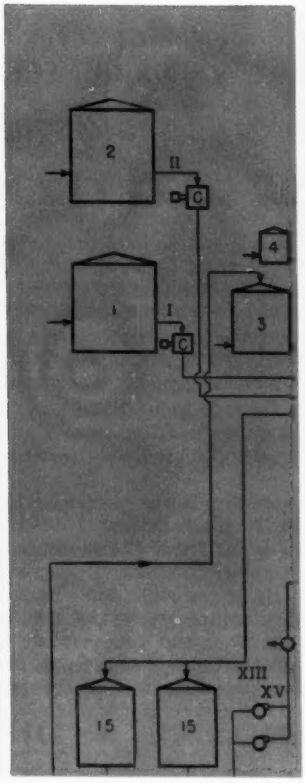
Howard H. Leiner, to executive chemist, Resin Research Laboratories (Newark, N.J.).

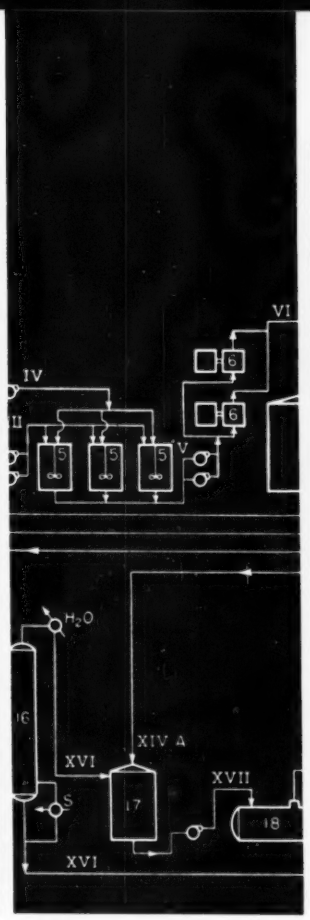
Wilbur H. Brumfield, to assistant to the president of Solvay Process Division, Allied Chemical & Dye Corp.

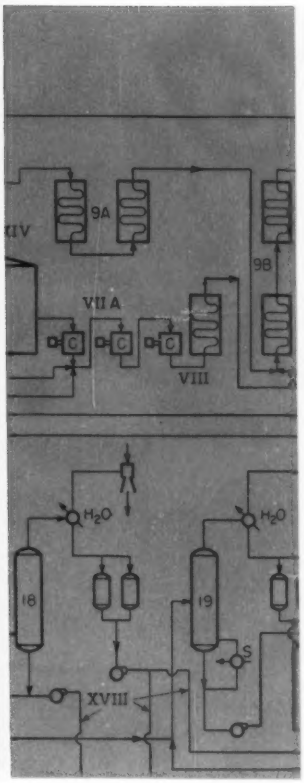
RETIRED

Henry Bower, president, Henry Bower Chemical Mfg. Co.

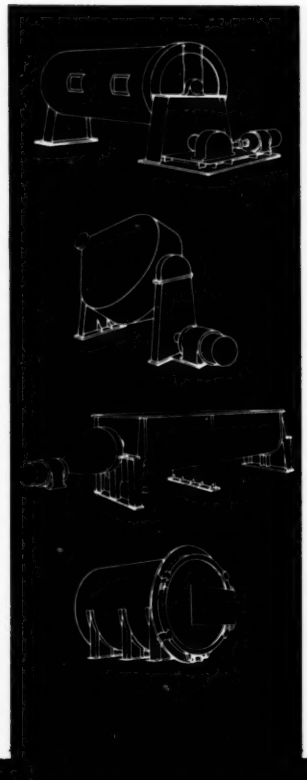


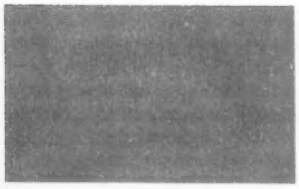


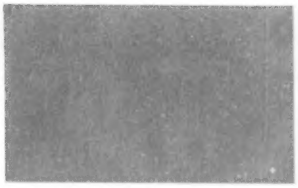




PROCESS EQUIPMENT







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DESIGNERS • ENGINEERS • MANUFACTURERS

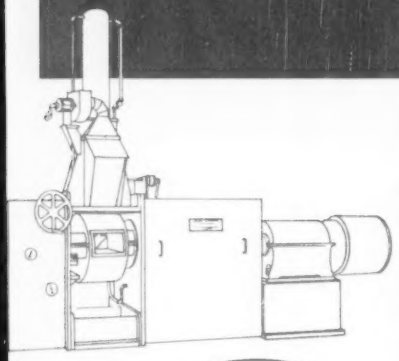
of large scale and special-purpose

PROCESS EQUIPMENT

DRAVO ROUND TABLE

Like many other Dravo Products, large scale and special-purpose Process Equipment receives the benefit of the Dravo Round Table method of design. Equipment developed from both sides of the drafting board—combining the customer's specialized operating knowledge with Dravo's technical and engineering experience—sets consistently high standards of performance.

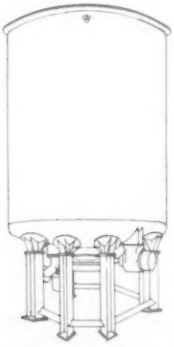
The Dravo Round Table Method puts selection, design and construction on a sound, personal basis that screens out unworkable ideas and produces equipment that is right the first time.



INTENSIVE MIXERS

In the new Dravo Intensive Mixer particular design emphasis has been given to the problems of better chamber discharge, rotor packing leakage, uniform heat transfer, and long service life of rotating and agitating parts.

Extra heavy-duty rotors are cored for heating and cooling separately from the mixing chamber which is also jacketed on sides and bottom for close control of batch temperature. All shafts are carried on oversize roller bearings and gears are hardened steel, totally enclosed and continuously lubricated. Rotors and inside chamber walls can be hard-chrome plated to resist abrasion and corrosion from batch ingredients. Other types of hard facings are also available when desired.

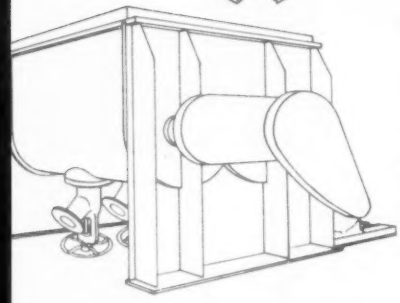


LIQUID BLENDERS • DISSOLVERS

Special purpose blenders and dissolvers are designed and built by Dravo for production use with the more difficult and viscous solutions. Since units are generally custom fabricated, designs vary over a wide range.

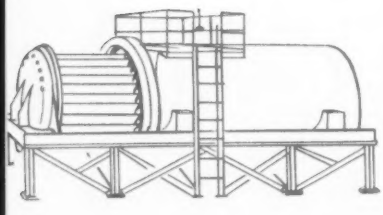
For example, either turbine, modified turbine, or propeller agitation may be employed; agitators may enter the blending chamber at the top, side or bottom. Baffled or unbaffled jackets for heating or cooling are readily incorporated, as well as heated or cooled draft tubes. Units are equipped for vacuum or pressure operation when desired. Interior surfaces are carefully finished to meet job standards. Vessels are usually of dished bottom construction for higher strength and better cleaning.

Capacities range from 500 through 10,000 gallons. Units are supplied in carbon steels, stainless steels, nickel, clad metals and other weldable metals or alloys.



KNEADING MACHINES

Dravo-built Kneading Machines are designed to meet rigid requirements in heavy-duty mixing, kneading and shredding processes. Machines are offered with a choice of tilting, gate, or valve discharges for easy unloading of mixed materials. Covers can be provided for vacuum, atmospheric, or pressure operation. Troughs may be jacketed and blades cored for very close control of process temperatures and improved heat transfer. Mixing chambers may be level or may be stepped for complete discharge with a single bottom opening. Mixing arms are furnished in either tangential or overlapping arrangements as determined by the materials to be mixed. For severe abrasive conditions, replaceable trough liners and wearing shoes are provided.



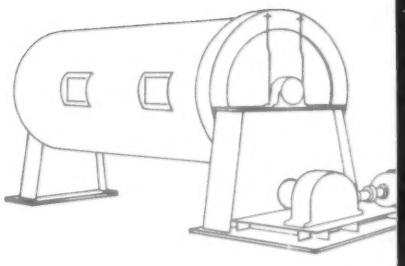
PRESSURE FILTERS

Pressure filtration equipment is designed and fabricated for large scale or special purpose installations. At Dravo new techniques and construction materials are constantly reviewed to insure the best possible design for each filtration problem.

In many applications where greater accessability and easier cleaning are desired retractable shell equipment, similar to that now being adopted by the aluminum industry, has improved operating conditions. Retractable shell design offers the extra advantage of a closed discharge system since all discharge piping is permanently connected to the filter head.

Dravo's engineering staff is readily available to work with you on your separation problems.

BALL MILLS

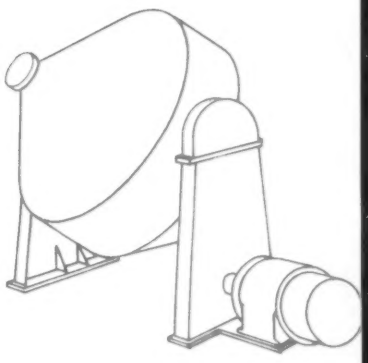


Dravo Ball Mills are available in a variety of production sizes with high-torque drive motors, inching controls and integral magnetic brakes for positive load and discharge positioning. Both interior and exterior finishes are tailored to the needs of the job to be done. Design of jacketed mills eliminates leakage possibilities by proper distribution of hub stresses. Jacketed mills can be furnished with insulation for more efficient removal of internal heat.

Mills rotate on self-aligning, anti-friction trunnion bearings mounted on heavy welded steel bases which assure correct alignment and freedom from vibration.

CONICAL BLENDERS

for blending dry powders—distributing liquids on powders—vacuum drying and blending



Dravo Conical Blenders give exceptionally gentle folding action for thorough mixing in short work cycles. The steep slope and smooth finish of interior walls provide immediate material fall-away during rotation as well as fast and complete discharge of finished blends. This gravity-cleaning characteristic simplifies cleaning procedures and helps eliminate cross contamination of batches. All interior welds are hand ground and surfaces wire brushed. Special polishes and finishes are used when required.

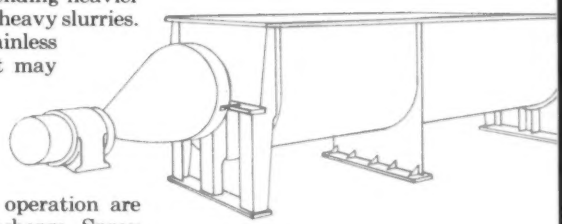
Blenders are held in charging or discharging position by magnetic brakes mounted integrally with the gear-head drive motors. Sifting is eliminated by use of dust-tight discharge valves and swing-bolt charging covers.

Blenders may be constructed with electrical heaters or heating and cooling jackets for water, steam, Dowtherm or hot oil. Designs include provisions for vacuum or pressure operation, if desired, as well as liquid distributors and devices for reduction of agglomerates.

Heavy-duty production units, in sizes through 2000-cu. ft. or more, are supplied in carbon steels, stainless steels, nickel, clad metals and various special metals required where corrosion and contamination are acute problems.

HORIZONTAL BLENDERS

for blending dry powders—powders with liquids or pastes

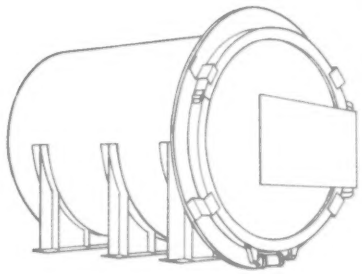


Horizontal Blenders are manufactured by Dravo in ribbon blade and pug mill types for light through heavy-duty operation. Ribbon blade types are used in blending such things as plastics, plaster, agricultural formulations, dry colors, dye-stuffs and similar powders. Pug Mill construction is used for blending heavier materials such as clays, pastes, phosphate fertilizers, plastic solids, and heavy slurries.

Dravo constructs these blenders in production sizes in steel, stainless steel, nickel, clad metals, and other weldable metals or alloys that may be needed for unusual blending conditions. All units are equipped with heavy shafting which is supported externally in sealed, anti-friction bearings. Details of trough construction as well as blade sizes, speeds, and wall clearance are designed to the needs of the job to assure finished blends that are smooth and uniform.

Jacketed or unjacketed units for internal pressure or vacuum operation are available with tilting chamber, sliding gate, or flush plug valve discharge. Spray pipe distributors for introducing liquids are included when desired.

QUICK-OPENING DOORS AND PRESSURE VESSELS



Dravo manufactures Quick-Opening Doors and Pressure Vessels to meet any requirement for this type of equipment. Construction and materials comply with ASME Code Specifications for Unfired Pressure Vessels. Quick-Opening Doors may be supplied as part of a complete vessel assembly or for mounting on existing units.

These unique doors *lock more tightly as internal pressure increases*. This feature provides an extra margin of safety, preventing accidental opening while the vessel is under pressure. Doors are of one-piece, dished head construction and are equipped with self-sealing gaskets which are compressed to form a leakproof seal by internal pressure of the vessel. Doors may have manual or fully automatic opening arrangements which permit opening and closing times measured in seconds.

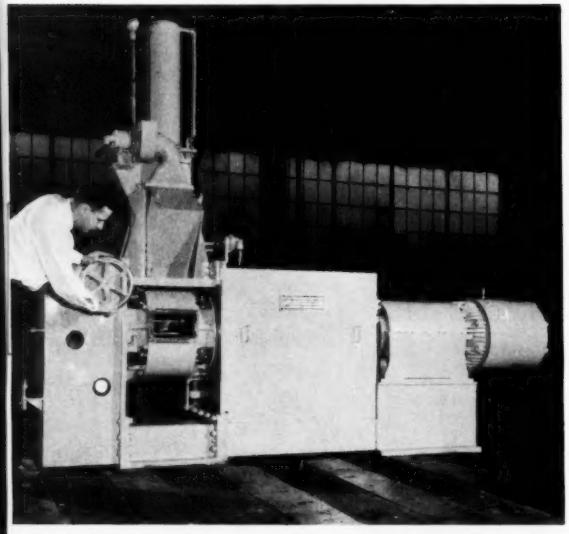
Pressure Vessels equipped with Dravo Quick-Opening Doors are also designed and fabricated to meet special application requirements. Specialized work-handling equipment—such as may be needed for steam vulcanization, concrete block curing, metal-to-metal bonding, etc.—may be designed and constructed by Dravo to assure the high operating efficiency of an integrated assembly.

The second of four large liquid blenders (8000-gallon working capacity) receives preliminary power testing in the Dravo Machine Shop.

SPECIAL-PURPOSE EQUIPMENT

The need for lower process costs often requires the fabrication of special purpose equipment. The difficulties involved in translating ideas for such units into practical, economical pieces of equipment make the choice of a supplier doubly important.

Dravo's facilities are geared to the needs of heavy equipment and special designs. Since 1891, Dravo operations have been characterized by the practical engineering know-how essential to successful large scale equipment.



The mixing chamber of this one-gallon intensive mixer uses one opening to minimize leakage. The chamber is quickly rotated to discharge position.

FACILITIES

Process Equipment is fabricated at Dravo's 100-acre plant on Neville Island, near Pittsburgh, in the heart of the nation's steel-producing area. Principal shops include light and heavy machine, sheet metal, structural and fabricating, carpenter, paint, electric—as well as indoor and outdoor assembly areas.

Products are loaded directly from Dravo's shops for transport by river, rail or truck.

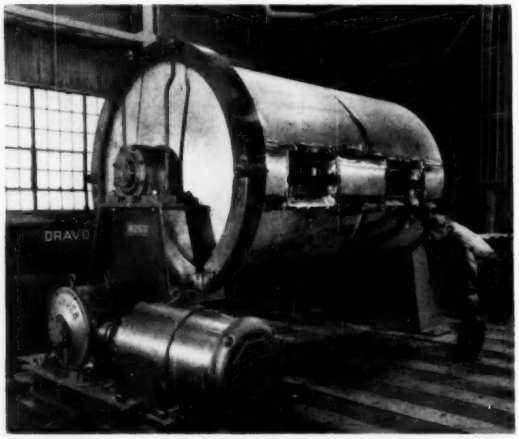
STRUCTURAL SHOP

The Structural Shop is typical of the large-scale facilities at Dravo. Occupying 2.5 acres under roof and 3.2 acres for storage, the Structural Shop is equipped for efficient fabrication of even the largest equipment.

Three conventional shears and one double-edge shear cut 1-inch mild steel plate and angles up to 6 x 6 x 1 inch. Two modern tracing machines and hand and portable track equipment are used to flame-cut material up to 12 inches thick on a production basis. A 36-foot plate edge planer and a column facer can close-size raw material.

A number of machines are available for hot and cold-forming. The 1000-ton bend brake can flange a $\frac{3}{8}$-inch, 36-foot long plate up to 90 degrees in one stroke. In addition, there are a 650-ton mechanical press, angle bending rolls, plate bending rolls, a 750-ton four-poster hydraulic press with 6-foot by 10-foot bed, a bulldozer and two gag presses.

Fitting and welding departments are equipped for ready assembly of weldments up to 25 tons. The latest methods and equipment for manual and automatic welding are used, with quality control and production techniques supervised by a weld engineering department.



This polished stainless steel ball mill is jacketed and insulated for close temperature control during resin grinding.

MACHINE SHOP

All major machine shop equipment is less than 15 years old and an annual replacement program maintains this up-to-date policy. The shops are equipped with 10-ton and 50-ton capacity overhead cranes and floor-operated jib cranes.

Lathe equipment, all powered for carbide tooling, ranges from 16-in. high speed to a maximum swing of 70 in. and maximum length of 35 ft. between centers. Vertical boring mill equipment includes bullards to 54-in. swing and mills of 7-ft. to 26-ft. maximum swing.

Work of unlimited size can be handled on table and floor type horizontal boring mills. Three large planers can take pieces 12 ft. wide by 6 ft. high by 40 ft. long. Precision assembly is made on a 45-ft. by 65-ft. floor plate.

The tool room is equipped with small lathes, milling machines and a full complement of standard machine tools, grinders, universal grinders and hones.

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Neville Island

Pittsburgh 25, Pennsylvania

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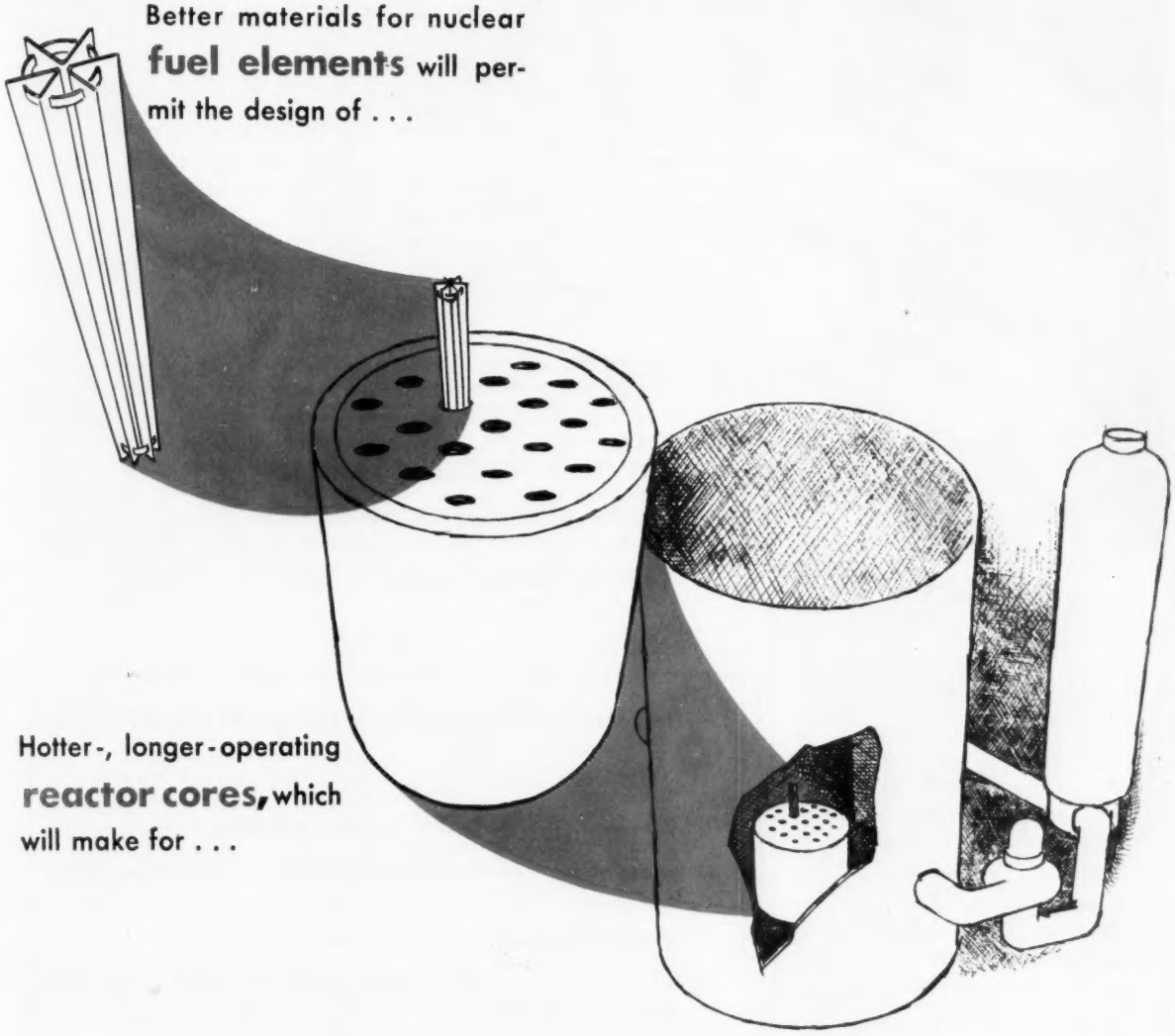
Better materials for nuclear **fuel elements** will permit the design of . . .



Hotter-, longer-operating **reactor cores,** which will make for . . .

Smaller, more efficient nuclear **power plants.**

Fuel-Element Research Goes Critical

Fuel elements were to blame for the recent troubles of Britain's Calder Hall nuclear power plant—the world's first (*CW Technology Newsletter, Feb. 16*). Fuel elements of future power reactors are likely to be much sturdier.

They'll have to be if atomic power is to be competitive with power from other fuels. That's because the hotter a nuclear reactor operates (most power reactors are now designed for 900 F or less), the more economical it becomes as a power source. Moreover, high-temperature operation permits design of smaller, more compact plants at a saving in capital investment. As the heart of the reactor (*see above*), fuel elements bear the brunt of this heat (and radiation), must be rugged.

What They Are: Fuel elements are structures of varied cross-sections that contain fissionable material* such as U-235. In a reactor, they're the source of atomic fission that produces the heat for utilization by steam-driven electric generating equipment.

Fuel elements can vary widely in makeup. They may contain uranium or thorium in metallic or compound form under a metallic cladding (for protection from corrosion). Cladding metals include stainless steel, nickel-chromium, aluminum, magnesium, zirconium, beryllium, titanium, nickel, chromium,

*Nuclear fuels can be solid or liquid, but most power reactors considered to-date employ solid fuels. The bulk of current research, therefore, is on solid fuel elements. Liquid fuel systems are highly corrosive.

copper, silicon, niobium and molybdenum. These metals may also be used in a mixture, alloy or cermet (mixture of ceramic and metal) with uranium or thorium in the fuel-element core.

Fuel elements vary in shape, size and makeup according to the type of reactor they are intended for. In general, an element is a thin hollow structure (e.g., tubular, square, hexagonal in cross-section) about 4-6 ft. long, and about 4-6 in. in diameter. A number of fuel elements assembled in a specific shape make up the reactor core.

Each tube-like fuel element contains the solid nuclear fuel in either pellet, plate, rod or other shape, depending again on the type of reactor. In this shape, the fuel itself is clad with suitable material.

Far from Ideal: None of the fuel-element structural materials in use today, however, is close to ideal—or even very good for the job. They can't withstand high temperatures (and fission processes develop temperatures of many thousands of degrees). And, because of the effects of radiation, the life of a fuel element is short. In fact, only about 1% of the nuclear fuel in a given element today is consumed before the element must be pulled out of service.

A fuel element's short life results principally from structural damage by neutrons. Also, the fuel is poisoned by a gradual buildup of fission products.

Fuel-element research now is aimed at obtaining maximum chemical purity for components, flaw-free fabrication, and chemical reprocessability. Paradoxically, while the elements must be made as indestructible as possible, they must ideally lend themselves to recovery of unspent fuel and waste fission products.

What the fuel element designer is up against.

His materials must be:

1. Dimensionally stable under radiation and heat.
2. Strong over a wide temperature range—and possess thermal shock resistance.
3. Corrosion resistant.
4. Resistant to excessive neutron absorption, which would slow down the fission process.

He must assemble these materials so that:

1. Nuclear fuel is in a configuration that will support a chain reaction.
2. Fuel itself will resist distortion and breakdown under fission bombardment.
3. Fuel is effectively encased to prevent escape of radioactive fission products.
4. Configuration will support loading and unloading of fuel.
5. Configuration will permit introduction and removal of controls that regulate fission process.
6. Configuration will permit coolant material to flow through for heat removal.
7. Chemical separation of unspent fuel and fission products can be carried out.

ATLAS chem-memos

CHEMICALS DIVISION
ATLAS POWDER COMPANY, WILMINGTON 99, DELAWARE
Atlas Powder Company, Canada, Ltd., Brantford, Ontario, Canada

SORBO® puts "squeeze appeal" in grained marshmallow candies

...takes squeeze off production

Grained marshmallow candies, often made into shapes of miniature animals, eggs and the like, are a real treat for the kiddies—but a big headache for manufacturers. When made by conventional formulas, they become unpalatably hard in a few weeks. And as they get brittle, tend to break in the package, detracting from their eye appeal.

SORBO, Atlas sorbitol solution, has solved this problem for many candy makers. From 10 to 15% SORBO in standard marshmallow recipes keeps these confections temptingly soft for as much as six months. SORBO candies aren't sticky, either. They look and "squeeze" as good as they taste—an important factor when so much of this candy is sold in transparent packages.

There's another plus value in SORBO of especial interest to candy makers. Because of extra shelf life, manufacturers can produce SORBO grained marshmallows in advance of peak demand seasons, and eliminate the cost of periodic production peaks.

SORBO is being advantageously used in many candy formulas. We'll be happy to cooperate with you in applying this unique material in your own formulas, and to send you our booklet, "Sorbitol in Confections" that explains the why's and how's.

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Adsorption by DARCO activated carbon improves the quality of many different kinds of products, by taking out certain impurities that can detract from appeal to the eye, the taste or the nose.

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Odor. Many of the impurities that cause undesirable odors and off-tastes are large, complex molecules that are readily adsorbed by DARCO.

Haze, usually caused by precipitation of nearly insoluble impurities, can be cleared up by DARCO treatment.

Foaming is caused by surface active agents, which DARCO can remove for you.

We'll be glad to apply our long experience in adsorption to your specific product purification problems.

How to make a cologne-type anti-perspirant stick

If you're in the cosmetics business, you've probably been hearing about the 4-Point Atlas Program for helping formulators save time and money, through our expanded technical help. One of the latest news items from this program is information on how to formulate alcohol-based "cologne stick" type anti-perspirants.

This type of product was virtually impossible to make until a few months ago, owing to the incompatibility of usual anti-perspirant ingredients with the soap needed as a gelling agent. Now, however, a new soap-compatible material, developed by the Reheis Co., Berkeley Heights, N.J., makes such sticks practicable.

Our new Cosmetic Bulletin explains how to use our SORBO sorbitol solution, N.F., in these sticks. As a humectant, it gives superior protection against drying out of the stick, prevents formation of objectionable deposit on the skin.

Write to us for Bulletin on this subject. New Atlas Cosmetic Catalog, Guide and Formulary booklets are also available to cosmetic manufacturers.

RESEARCH

There's hope that these stringent requirements can be met. New alloys are turning up, yielding improved fuel-element performance. New ceramic materials* offer promise that high temperature-resistance requirements can be met. Atomic Energy Commission researchers as well as industry probers are stressing studies of ceramics and cermets.

Who's Researching: A leader in the ceramics research is Corning Glass Works, which teamed with Sylvania Electric to set up Sylvania-Corning Nuclear Corp. (Bayside, L.I.). The latter will work exclusively on nuclear problems.

According to Corning's vice-president and director of research and development, William Armistead, UO_2 now shows the most promise as a ceramic fuel element. Its composition of U-238 and U-235 can be varied to suit a particular core design. UO_2 ceramics have melting points or eutectics of 1900 C or higher, are prepared by sintering at 1750 C.

But while the known ceramics resist corrosion and are probably better than metals and alloys as containers of fission products, they lack mechanical stability. Ceramic fuel elements are brittle, unable to withstand sudden shock, either mechanical or thermal. Another serious defect is their relatively poor thermal conductivity, compared with metals.

Armistead maintains that these problems must be met by a two-pronged attack: the ceramist must do his part to produce the best possible elements, and the reactor designer, in turn, must design for ceramics.

Armistead doesn't feel that the spent ceramic element will offer any unique reprocessing problems, since UO_2 is readily oxidized and put into solution.

Here's what others are doing on this problem.

- Babcock and Wilcox (New York) has a research project on ceramics, is investigating uranium oxide and thorium oxide mixtures.
- Horizons Incorporated (Cleveland) is working on ceramics for fuel elements.
- General Electric, which makes UO_2 fuel pellets, is conducting research in ceramics at San Jose, Calif.

*Ceramics for nuclear fuels are stable, crystalline, nonmetals melting or softening above 2000 C. By this definition, oxides, nitrides, silicides, carbides and borides are ceramics.

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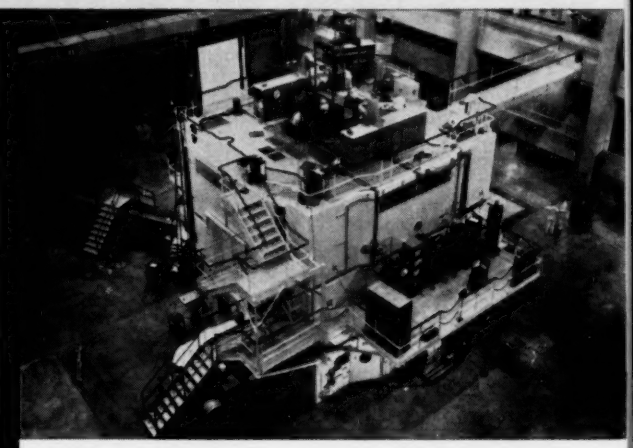
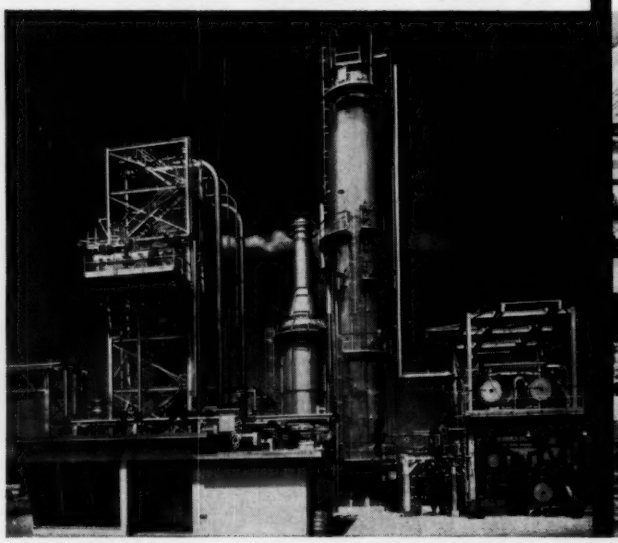
Chlor-alkali plant for Olin Mathieson Chemical Corporation
McIntosh, Alabama

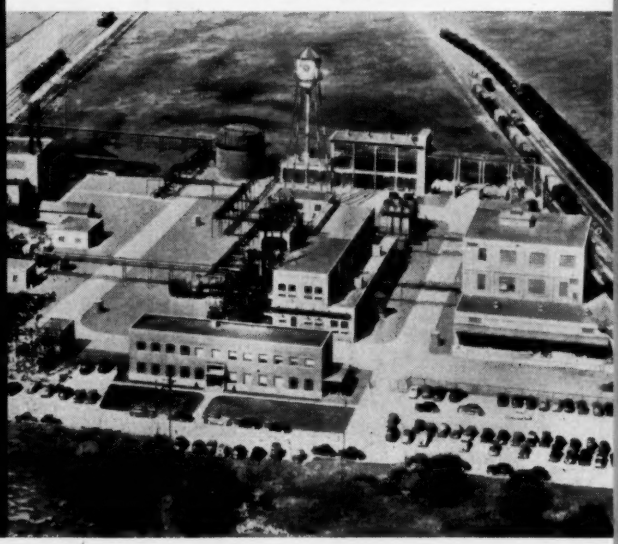


Materials testing reactor for the Atomic Energy Commission
Idaho Falls, Idaho

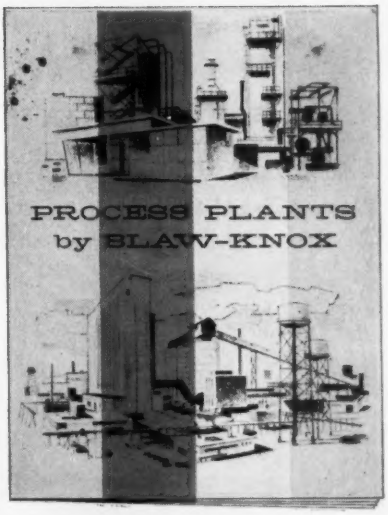
Petroleum refining unit for the McMurrey Refining Company
Tyler, Texas



Resin plant for Glenn L. Martin Co.
Painesville, Ohio



AND EXTENSIVE EXPERIENCE



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Bulletin No. 2514 outlines briefly the scope of our competence in various process industries. A copy is available on request.

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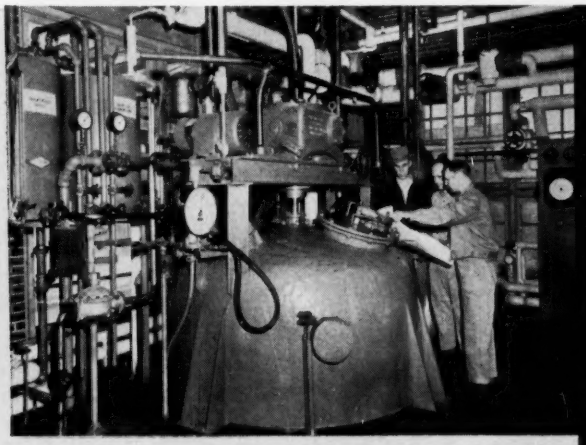
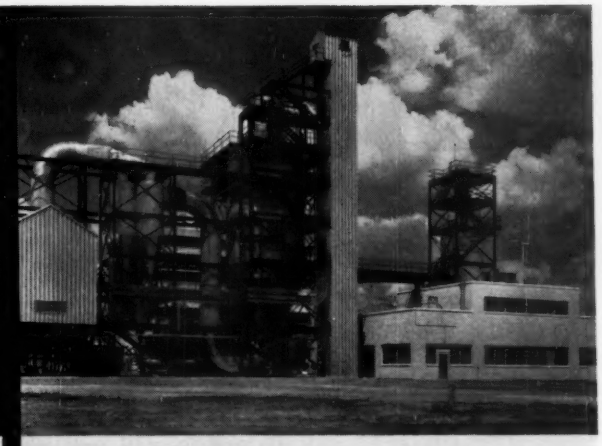


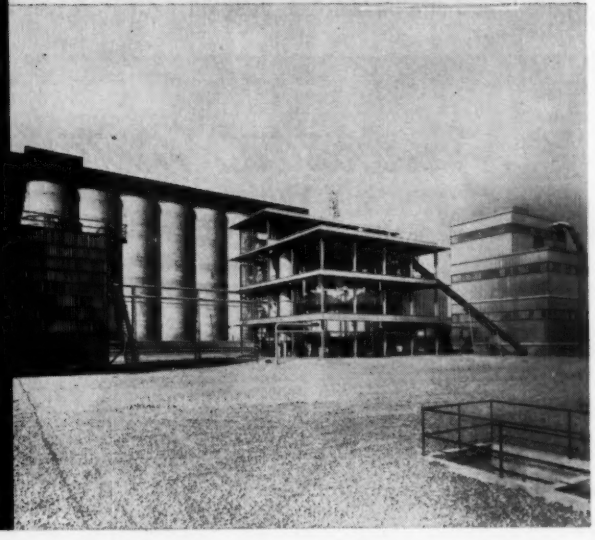
Fine-chemical facilities for Mallinckrodt Chemical Works
St. Louis, Missouri



Instant dried starch plant for Corn Products Refining Company
Corpus Christi, Texas

Fertilizer plant for Illinois Farm Supply Company
Tuscola, Illinois

Soya bean processing plant for Central Soya Company
Chattanooga, Tennessee



RESEARCH

• Olin Mathieson recently set up a nuclear fuel division, is concentrating on how to make present materials faster and more economically. It's studying metals: uranium, zirconium, hafnium and alloys of hafnium. Present goal is to make present fuel element models cheaper and faster.

• Battelle Memorial Institute (Columbus, O.), whose background in atomic energy dates back to early 1942, is studying uranium alloys of zirconium, molybdenum, niobium, and uranium dioxide in ceramics. It is doing development work on a wide variety of fuel elements, with the general objective of improving temperature and corrosion resistance.

• W. R. Grace's Davison Chemical Division (Baltimore) is developing thorium oxide, which can withstand temperatures up to 5000 C. The chemical purity and packing characteristics are being studied.

• North American Aviation (Los Angeles) reports it is researching thorium-uranium base alloys and uranium-base alloys, says uranium dioxide and uranium carbide are "two of those compounds that appear promising." It's trying for temperature limits of 2000 C (core) with these two compounds, about 750 C with metal-base alloys.

• Mallinckrodt (St. Louis) is working with uranium metals, uranium alloys, uranium dioxide clad in Zircaloy.* The firm is also researching mixes of uranium dioxide and other metal oxides. It feels uranium dioxide is the best yet, will be used in the first power piles, will withstand thermal shocks over the 1000-3000 C range.

• Sylvania-Corning Nuclear Corp. reports via Chief Engineer Bernard Kopelman, that it is conducting development and engineering work along the lines of the entire range of currently used fuel elements. It's working on a ceramic uranium-oxide type of fuel element, clad either with stainless steel or Zircaloy. This is currently the most popular type of fuel in commercial power reactors.

The company is also working with the cermet type of fuel, wherein the core consists of a mixture of uranium oxide or other uranium compounds with a metallic matrix.

• Minnesota Mining & Mfg. Co.'s

*Zircaloy is a sponge zirconium-base alloy, containing (by weight) 1.5% tin, 0.12% iron, 0.05% nickel, 0.10% chromium.

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coordinator for atomic energy, James Johnson, states that siliconized silicon carbide (Si-SiC) gives excellent promise. It has low neutron absorption, good temperature resistance, mechanical strength; raw materials are readily available.

• Armour Research Foundation (Chicago) and Argonne National Laboratories (Lemont, Ill.) are cooperating, also doing independent work on other fuel-element projects. The most promising materials, they say, are carbides, silicides, thoria and urania. Target temperature resistance today is 1000 C down to room temperature.

Armour makes some test elements for Argonne, which incorporates molybdenum fibers in thoria compacts. These are reportedly quite strong, will withstand quenching from 1000 C down to room temperature. Argonne is now checking extent of radiation damage to them. But these may prove difficult to make on a production basis. Also, molybdenum has high neutron absorption, reacts with oxygen.

• Nuclear Metals Corp. (Cambridge, Mass.) has plenty of research experience in the field, is now writing a book for AEC on the entire subject. It has worked with many metals, is also doing work with ceramics. The firm feels that while ceramics look promising in experiments, they have yet to prove themselves in practice. In ceramics, it has worked with uranium oxide and beryllium oxide. For the future, the firm feels that besides uranium oxides, other uranium compounds, e.g., intermetallic ones, offer possibilities.

• Westinghouse is working in many different areas of materials and ceramic research. This work extends from basic scientific efforts in the Westinghouse research laboratories to more specific metallurgy programs in materials engineering and commercial atomic power activities.

Specifically, in the pressurized-water reactor line, it is working with metal-clad uranium dioxide ceramics. The firm thinks that uranium dioxide ceramic has the most promise in the metal-clad fuel element program.

The Outlook: Nuclear fuel elements so far have been made mostly with materials at hand. But new, tailored materials are in the offing. With their advent, a new era in nuclear technology will open.

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- ✓ Hair waving
- ✓ Stabilizer for acrylonitrile polymers
- ✓ Intermediate for extreme high pressure lube oil additives
- ✓ Depilatory
- ✓ Intermediate for special textile softening and dying agents

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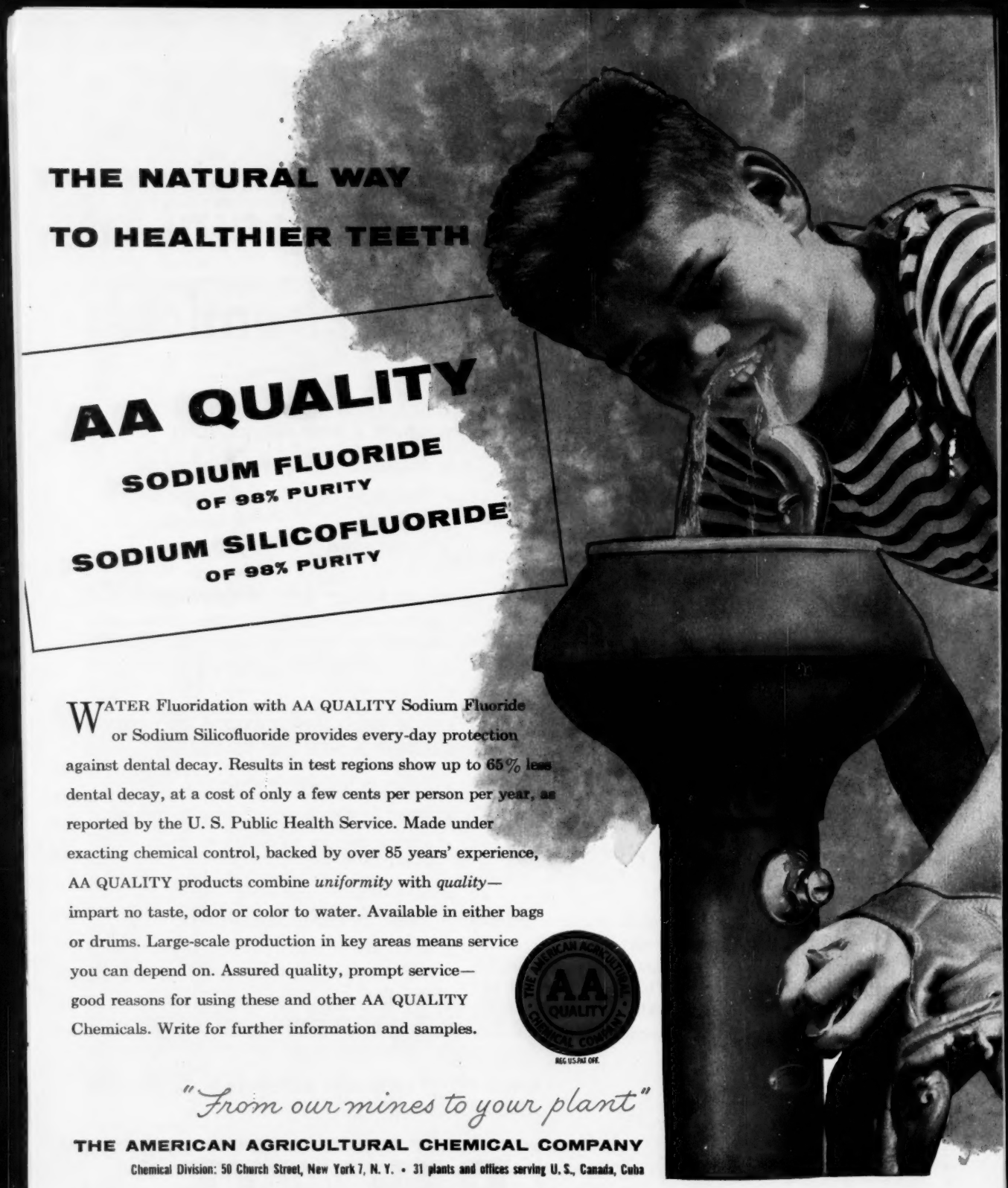

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Technology
Newsletter

CHEMICAL WEEK
April 13, 1957

A new partnership in boron research is shaping up. Mine Safety Appliances Co. and Gulf Oil Corp. have decided to pool their resources in a joint program of research and production in "boron chemistry, including high-energy fuels."

The joint enterprise will be carried out by Callery Chemical, the Mine Safety Appliance subsidiary that's building a $38-million, high-energy fuel plant for the Navy at Muskogee, Okla.

Aside from its implications for the all-important field of boron chemicals, this move is rife with significance for the chemical industry. Gulf's decision to declare itself "in" on the high-energy fuels program is another link in the lengthening chain of evidence that chemicals—rather than conventional petroleum stocks—will be the fuels of the future *(CW Technology Newsletter, April 7, '56)*.

•

The fluidized-bed method is being applied to the nuclear fuel element problem *(see page 63)*. Fluor Corp. (Los Angeles) has received a contract from the Atomic Energy Commission to develop special forms of uranium, thorium and other nuclear fuels.

Most of the work on fuel elements now is concerned with either solids or liquids. But the liquids are corrosive, and the solids must be clad. Fluor will explore the possibilities of using fluidized solid particles, which might bypass some of the drawbacks of the other systems.

It's not a brand-new concept. Fluor itself has been working on it for more than a year—without any funds from the AEC. But even though Fluor says that it will take another year or more to determine the desirability of trying the technique in an experimental reactor, the work is bound to grab plenty of attention in the tricky nuclear fuel element field.

•

Now iproniazid is finding application in mental therapy. That was revealed at an American Psychiatric Assn. meeting in Syracuse last week.

Developed by Hoffmann-La Roche, iproniazid (a derivative of isonicotinic acid hydrazide) was originally unveiled as a tuberculosis drug. Its new role is as a resurgitive (as opposed to tranquilizer) for improving the mood among "long-term, untouchable psychotics of the burned-out kind."

It is also reported to have proved effective in stimulating appetite, boosting weight and general well-being of members of a group of rheumatoid arthritis sufferers.

•

Freeport Sulphur will locate its new nickel and cobalt reduction plant at Braithwaite, La. This is the $100-million project it is undertaking to exploit big ore deposits in Moa Bay (Cuba). The ore will be mined and leached in Cuba, then shipped to Braithwaite for separation and reduction of the metal (*CW Technology Newsletter, March 16*).

Technology
Newsletter

(Continued)

That new tetraethyl lead process developed by Ethyl Corp. (*CW Technology Newsletter, Dec. 15, '56*) is being unveiled at the meeting of the American Chemical Society in Miami this week.

The key: use of organometallics, which permit the formation of the TEL from some surprisingly inactive lead compounds (e.g., lead oxide, lead dioxide, lead sulfide). In the conventional process for making TEL, a sodium-lead alloy is reacted with ethyl chloride.

In one example of the new process, a mixture of lithium ethyl and sodium ethyl reacted with lead sulfide at 25 C for 4.5 hours produced an 81% yield of TEL. A number of other combinations of reactants were also tried. In general, the reactions are characterized by mild conditions and good yields. The presence of a solvent improved controls and the contact between the reactants.

The Ethyl researchers also worked up reactant combinations involving organometallic compounds and lead salts of inorganic oxy- and thio-acids (e.g., lead nitrate, lead sulfate) as well as lead salts of organic acids (e.g., lead formate).

Ethyl is staking out claims on organometallics in general, has just received a patent on a method of making triethyl aluminum (U. S. Patent 2,787,626).

Ethyl is frankly bullish about its work. It says, in fact, that it has uncovered a broad, new field.

At the same time, Ethyl points out that the new TEL process is still in the research stage. The present commercial process is a highly developed, efficient one. The major development work still needed on the new process means it is still years away from large-scale use.

•

A commercial-size dewar flask? The Bureau of Standards is working on the idea at its Cryogenic Engineering Laboratory at Boulder, Colo. The dewar is, of course, a vacuum-jacketed container with walls of high reflectivity to reject thermal radiation. Engineers at the cryogenic center are trying to substitute evacuated powders—perlite, diatomaceous earth, silica aerogel (*CW, Sept. 22, '56, p. 74*) and now have found they can provide a decided improvement over the standard dewar.

•

Nuclear power may become cheaper than hydroelectric power. But not for 30 years at least. So said Maj. Gen. Thomas F. Farrell in a report to New York's State Power Authority. Asked by Chairman Robert Moses to study competitive power sources, Farrell said that hydroelectric development of the Niagara River would yield power that would be safe from competition from nuclear power for at least that period. Even then, he pointed out, should nuclear power be cheaper, a hydroelectric station built now would be completely amortized and in a good position to refinance if necessary, and would still have a long life expectancy.

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CHEMICAL, PAINT AND METALLURGICAL DEPARTMENT OF MERRITT-CHAPMAN & SCOTT CORPORATION

The Many Faces of Warner-Lambert

Warner-Chilcott Laboratories (Ethicals—Gelusil, Peritrate, Releasin, Agoral)
Division of Veterinary Medicine (Paxital and Tricoil); Division of Laboratory Supply (Diagnostic items—Simplastin, Versatol). Mfg. and Admin.: Morris Plains, N.J.

Nepera Labs (Ethicals—Choledyl, Mandelamine, Biomydrin)
Mfg. and Adm.: Morris Plains, N.J.

Nepera Chemical (Bulk fine chemicals)
Mfg. and Adm.: Harriman, N.Y.

Anahist Co. (Proprietaries—Anahist and Super Anahist)
Mfg.: Outside contractor, Adm.: Yonkers, N.Y.

Emerson Drug (Proprietaries—Bromo Seltzer)
Mfg.: Baltimore; Adm.: Morris Plains, N.J.

Lambert-Hudnut (Toiletries—Listerine Antiseptic and toothpaste, Antizyme toothpaste, Quick Home Permanent, Hudnut hair products)
Mfg.: Lititz, Pa., St. Louis; Jersey City, N.J. (closing).
Adm.: Morris Plains, N.J.

Richard Hudnut (Cosmetics—DuBarry line, Hudnut cosmetics, Ciro perfumes, Sportsman Men's Toiletries)
Mfg.: Lititz, Pa., Adm.: Morris Plains, N.J.

Standard Laboratories (Home Remedies—Sloan's Liniment, Vince, Veracolate)
Mfg. and Adm.: Morris Plains, N.J.

Pro-phy-lac-tic Brush Co. (Sundries—toothbrushes, hair brushes, and combs)
Mfg. and Adm.: Florence, Mass.

Maryland Glass, Gulfport Glass (Glass bottles for drugs, foods, cosmetics etc.)
Mfg.: Baltimore; Gulfport, Miss.; Adm.: Baltimore

Warner-Lambert International (Marketing—sells all W-L divisions' products abroad) (Mfg.: 33 plants overseas)
Headquarters: Morris Plains, N.J.

Lambert & Feasley (Advertising Agency—biggest clients: Phillips 66, Listerine products)

Visitors at the dedication of Warner-Chilcott's new research laboratory building at Morris Plains, N.J., last Wednesday got a first-hand look at the latest addition to what's proving to be one the nation's most diversified and acquisitive industrial complexes: Warner-Lambert Pharmaceutical Co.

Manufacturer and marketer of toiletries, cosmetics, sundries, ethical and proprietary drugs, plastic advertising signs, dishware and even soft drinks (the now-being-test-marketed Fizzies), the present-day company is far different from its progenitor, the William R. Warner Co.

At the close of World War II, Warner, with sales of around $50 million a year, was almost entirely a cosmetic and drug house. But, in 1945, Elmer Bobst came out of retirement to assume leadership of the company, and started it on the way toward climbing sales—a fact Bobst does not deny.

Things look quite a bit different today than they did in 1945—especially in sales. For '56, company sales were $153 million (earnings after taxes: $11.5 million), putting the firm in pace with American Home Products and Johnson & Johnson.†

Here are some of the recent steps W-L took in reaching that $150-million class:

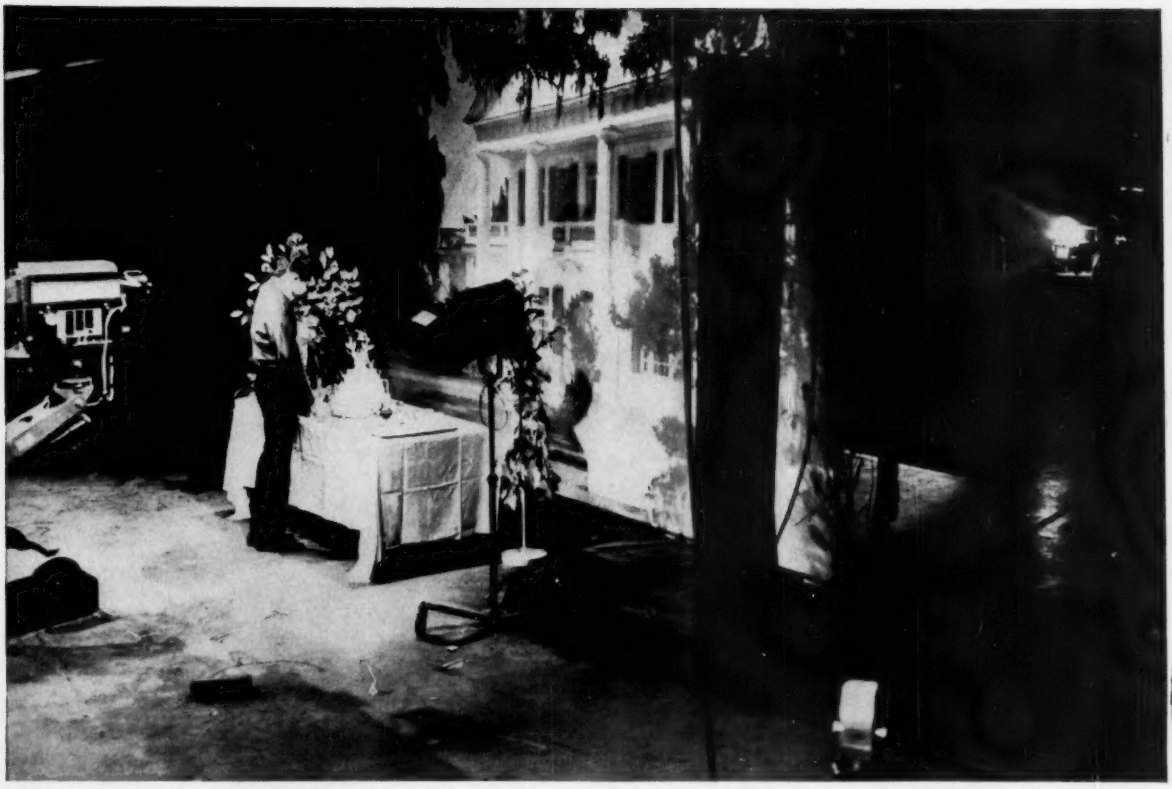
1950—First sold stock to the public, changed the company name from William R. Warner Co. to Warner-Hudnut.

1952—Bought Chilcott Laboratories (formerly the Maltine Co.). This moved the company more solidly into ethicals, reduced its dependence on lower-profit-margin cosmetics.

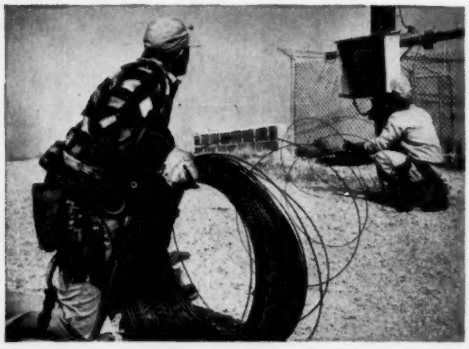
1955—Merged with the Lambert Co., best known for its Listerine antiseptic (W-L's present top money maker). This gave W-L a strong sales group, wise in the ways of mass marketing, also brought into the fold such specialties as Listerine and Antizyme toothpastes, the Sportsman line of toiletries for men. An advertising agency, Lambert & Feasly was in the

†Breakdown of sales; ethicals, medicinal and chemicals, 22.9%; proprietaries and sundries, 41.3%; toiletries and cosmetics, 19.4%; plastic and glass, 16.4%. International sales probably account for 30% of over-all sales (down from 45% before the merger with Lambert).

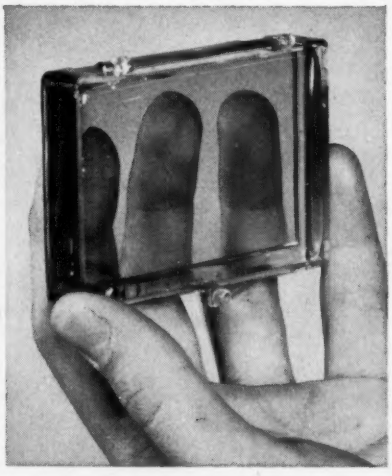
HOW *HERCULES* HELPS...



THE WORLD OF MAKE BELIEVE—
The magic of rear projection on this ethyl cellulose screen quickly transplants a TV or Hollywood studio to any locale in the world. For screens that will reproduce film with clarity and realism, Hercules® ethyl cellulose is selected by the Stewart Trans-Lux Corporation, Torrance, California. In addition, they use it in the manufacture of some of the nation's largest motion picture screens.



IMPROVE WIRE COATINGS—Coatings made with Hi-fax®, Hercules new linear polyethylene, are ideally adapted for use in corrosive environments. Hi-fax has excellent electrical properties, high-temperature resistance, and outdoor durability.



SUPPLY THE PAPER INDUSTRY—
Hercules is now manufacturing Pamite*, a new pale rosin (X to WG), at its multimillion-dollar tall oil distillation plants. Sizes made from Pamite have superior efficiency, high brightness, low foaming properties, and excellent handling characteristics as well.

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CHEMICAL MATERIALS FOR INDUSTRY

HERCULES

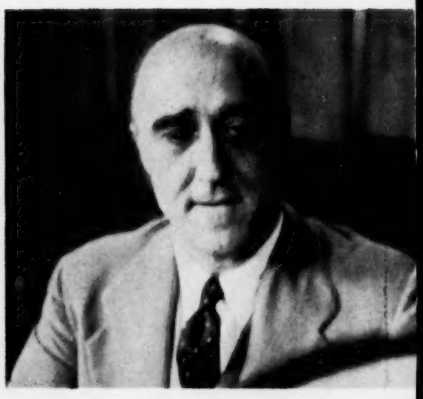
These men handle W-L's growing complex

Leonard Scheele: former Surgeon General heads up Warner-Chilcott Labs

George Mangun: Research Director of Warner-Chilcott

Joel Y. Lund: Toiletries and cosmetics are his bailiwick

Alfred Driscoll: From governor to firm president in one jump



Robert Glecker: Eyes W-L's big world markets

package, too, as was the Pro-phy-lac-tic Brush Co.

It was Pro-phy-lac-tic that brought W-L into the dish-making and industrial-molding fields. The Florence and Cadence (to the public) and Prolon (industrial) lines of dishes utilize equipment used to make toothbrushes. So do the industrial products: advertising signs, plastic chairs, weather stripping.

Also in '55 W-L took over Emerson Drug, thus acquiring Bromo-Seltzer and two glass-making adjuncts, Maryland Glass and Gulfport Glass.

1956—Merged with Nepera Chemical and its subsidiary, Anahist Co. In addition to providing W-L with two big-selling proprietaries, Anahist and Super Anahist, this gave W-L a basic source of a portion of the fine chemicals for its drugs—something it never had before. Nepera also brought in a line of ethicals.

And in that same year, the company dedicated its cosmetic and toiletry-making plant at Lititz, Pa.—Chairman Bobst's home town.

Along with some good properties, W-L has picked up some well known personnel. Besides 72-year-old Elmer Bobst himself, additions include Alfred E. Driscoll, the former governor of New Jersey (now company president) and Dr. Leonard A. Scheele, the former U.S. Surgeon General (now president of Warner-Chilcott Labs Div.).

Unfinished Structure: There's still an unfinished look to the present structure of the company—an inevitability for anything built up so fast. After all the merging, it's hard—even for insiders—to tell who is selling what. For instance the proprietary product, Bromo-Seltzer, is marketed

CSC NITROPARAFFINS

NITROMETHANE
CH_3NO_2

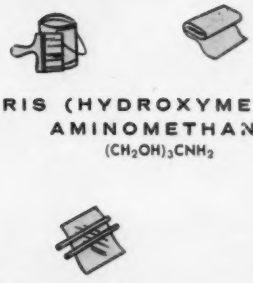
NITROETHANE
$CH_3CH_2NO_2$

1-NITROPROPANE
$CH_3CH_2CH_2NO_2$

IMPROVING PROCESSES AND PRODUCTS

2-NITROPROPANE
$CH_3CHNO_2CH_3$

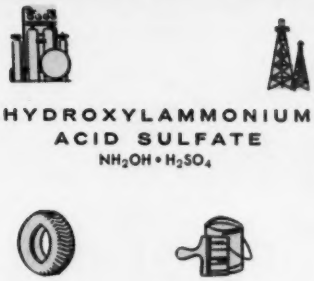
2-AMINO-2-METHYL-1-PROPANOL
$CH_3C(CH_3)NH_2CH_2OH$



TRIS (HYDROXYMETHYL) AMINOMETHANE
$(CH_2OH)_3CNH_2$

FOR AMERICA'S MAJOR INDUSTRIES

2-AMINO-2-METHYL-1, 3-PROPANEDIOL
$CH_2OHC(CH_3)NH_2CH_2OH$



HYDROXYLAMMONIUM ACID SULFATE
$NH_2OH \cdot H_2SO_4$

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In a relatively short time, the members of the nitroparaffin family found wide use in many important industries.

New groups of derivatives are being studied continually for new and profitable applications. Steadily increasing quantities of these unusual chemicals are being shipped from CSC's plant in Sterlington, La.

Our Market Development team is ready to work with you in applying these outstanding products to your processes and products. Samples and technical data sheets are available on request.

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through Lambert-Hudnut Division which ordinarily pushes only toiletries. But Anahist as well as Standard Labs (an acquisition made some years ago) still sell proprietary products with their own separate sales staffs.

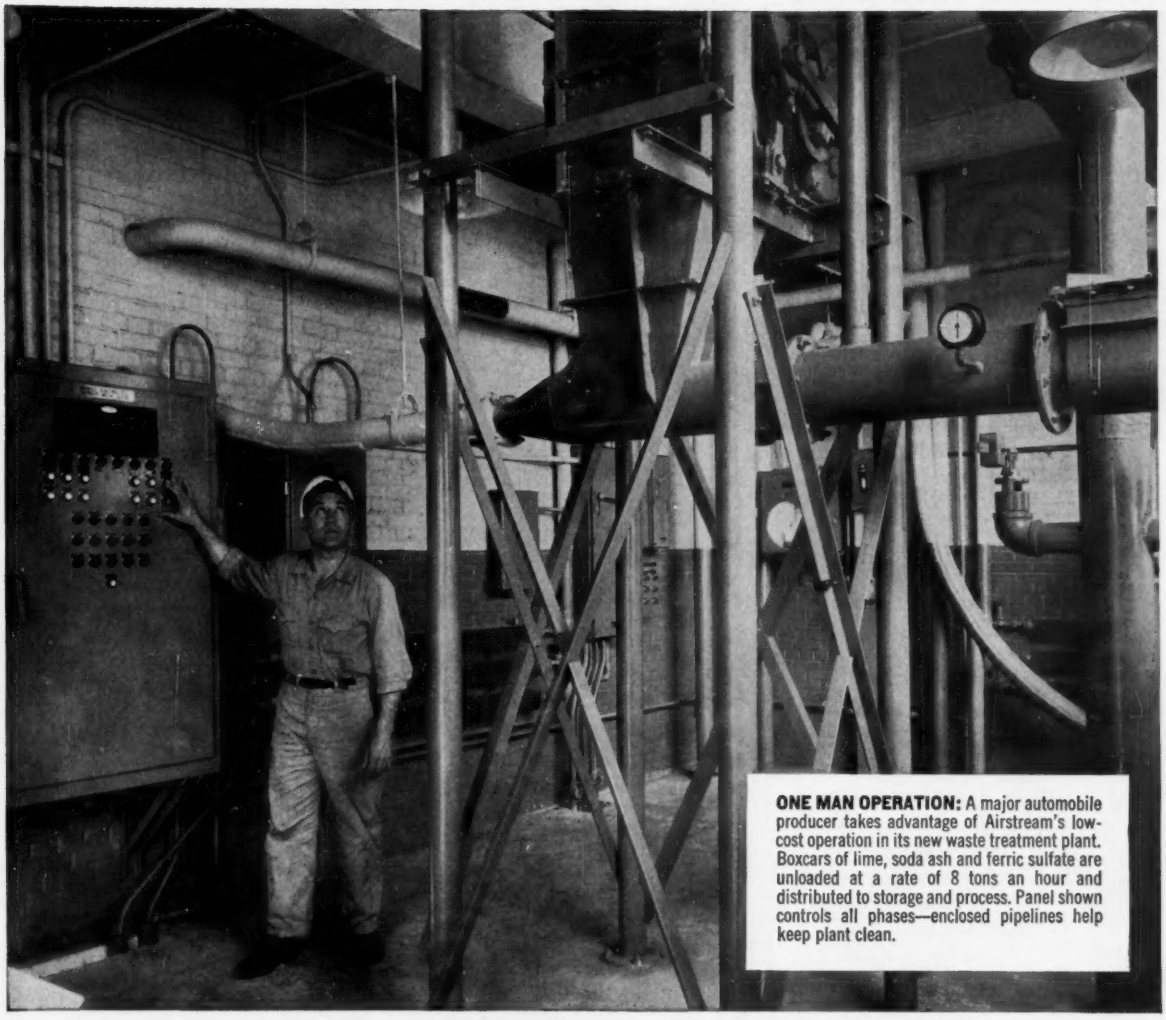
The ethical sales picture is a little confusing too. Both Nepera Labs (which has about 6 products) and Warner-Chilcott sell ethicals under their own names and with separate sales staffs—though research and manufacturing have now been consolidated at Morris Plains. Whether Nepera Labs is a division of Warner-Chilcott or of Warner-Lambert is still undetermined.

Also undergoing change constantly at W-L is the composition of Lambert-Hudnut. Its toiletries sales organization, largely staffed with former Lambert personnel, is considered an expert in mass marketing, hence has inherited the consumer items of several other divisions. Several Richard Hudnut products have already crossed over the road to this marketing unit to join Listerine. More will almost certainly make the trip soon. (On the other hand, some never will—DuBarry and Ciro, which rely heavily on prestige, for instance.)

Simple Dreams: Admitting that there's plenty of reshuffling in the works, company officials are looking with hopeful eyes to the day when they can put together a more simplified organization. Said one company spokesman, "If you tidy up, you end with four lines: cosmetics, toiletries, proprietaries and ethicals. We're still trying in our own mind to define the line between toiletries and proprietaries. Maybe this will mean creation of a sales force for straight proprietary selling—stronger than any present single sales force."

What does the company plan for the future? To get bigger. At least that is the impression you get from chairman Bobst who told *CW*: "Like it or not, we're in an era of big business—one in which it's hard for the small outfit to compete. It's only when you get large volume—and large profits—that you can afford the luxury of research.

"We think diversification is the best safeguard against a nose-dive. We're striving towards a well rounded business with a firm foundation—and I see no reason why Warner-Lambert shouldn't be the largest in its field."



ONE MAN OPERATION: A major automobile producer takes advantage of Airstream's low-cost operation in its new waste treatment plant. Boxcars of lime, soda ash and ferric sulfate are unloaded at a rate of 8 tons an hour and distributed to storage and process. Panel shown controls all phases—enclosed pipelines help keep plant clean.

how to unload and distribute bulk chemicals automatically

■ Industrial process and treatment chemicals are usually purchased in bulk. Unloading these materials and conveying them to storage or distributing to process creates a major handling problem. Many conveyors have been devised to handle these materials, but for plants using as little as one carload a month none has as many cost-saving advantages as a Dracco Airstream Conveyor:

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If you are planning new facilities which will require handling of bulk chemicals —or any dry bulk material—consider the advantages of an Airstream Conveyor. For more details, write or call Dracco today.

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Dracco Bulletin 529, "Airstream Conveyors", contains detailed information on equipment and uses. Shows examples. For your copy, write Dracco today.

DRACCO *airstream* conveyors
dust control equipment

FOUNTAIN PENS change, and so does the ink line-up.

Ball-Points Take the Play

Rossa Ralcliffe Chemical Co. (Cincinnati), a small manufacturer of writing inks, is now seriously considering two rather drastic possibilities: discontinuing its business entirely or going into the manufacture of paste for ball-point pens. Reason: ball-point pens have taken almost 90% of its fountain pen ink business.

The company's current problem is borne out by industry statistics. According to Thomas W. Casey, sales vice-president of Paper Mate Co. (a division of Gillette Co.), ball-point pens accounted for 84% of all pen sales in 1955. From 1946 to '55, ball-point pen sales more than tripled, while sales of conventional fountain pens dropped 28%. In '55, $111 million worth of ball-point units were sold at retail (including $9 million worth of refills)—a total of about 300 million units, compared with the fountain pen total of 40.8 million units.

Straight Line: While fountain pen sales have been slipping, the ink market has held steady for the past five years. It is estimated to be $15-20 million/year. Most ink makers agree that W. A. Sheaffer Pen Co. (Fort Madison, Ia.) has the biggest share of this business. (It ships three carloads of ink each day from its Iowa plant).

But they disagree as to who is in second place. Many think Parker Pen Co. (Janesville, Wis.) is No. 2, but here Parker disagrees. "We aren't as big as some of the people who sell ink alone," a Parker official says, citing Carter's Ink Co. (Boston) as No. 2.

Others place Carter's in a close three-way race for third spot with Waterman Pen Co. (Seymour, Conn.) and Sanford Ink Co. (Bellwood, Ill.). Rossa Ralcliffe typifies the "local" firm, which has been hardest hit by consumers' attraction to the ball-point type of pens.

The Ball Game: Assuming that 1,000 ball-point pens or refills can be made from a pound of ink paste, 1955 paste sales figure to about 300,000 lbs., worth up to $1.5 million.

Formulabs, Inc. (Escondido, Calif.), probably the largest manufacturer of ball-point ink, claims to have devised the "nonsmear" formula now in use. This company makes about 24% of all ball-pen inks produced in the U.S., controls—through licenses—another 56%. It also makes or licenses much of Europe's. Ball-point ink makers' biggest customer is Paper Mate, the largest maker of ball-point pens (Paper Mate claims to sell more than the next five companies combined).

Like Formulabs, many companies sell paste to makers of ball-point mechanisms, who in turn sell to makers of cases, who assemble and sell the final product. Other high-ranking ball-point ink makers are Carter's (more of a factor before the oil-base type was replaced by the present nonsmear type), Sheaffer and Parker. The bulk of the business in ball-point pens is in inexpensive nonrefillable models.

Nothing New: There has been little basic change in fountain pen ink formulation since 1922, when Sheaffer introduced Skrip, generally conceded to be the first "modern" ink. Earlier inks tended to crust (both in the pen and in the bottle), had poor lubrication qualities, were subject to mould (which cut down shelf-life), and the settling out of iron content in permanent types, leaving pale ink and unsightly bottles. Parker's Quink, which came out shortly after Skrip, is essentially the same type as the

latter—as are most inks now being sold.

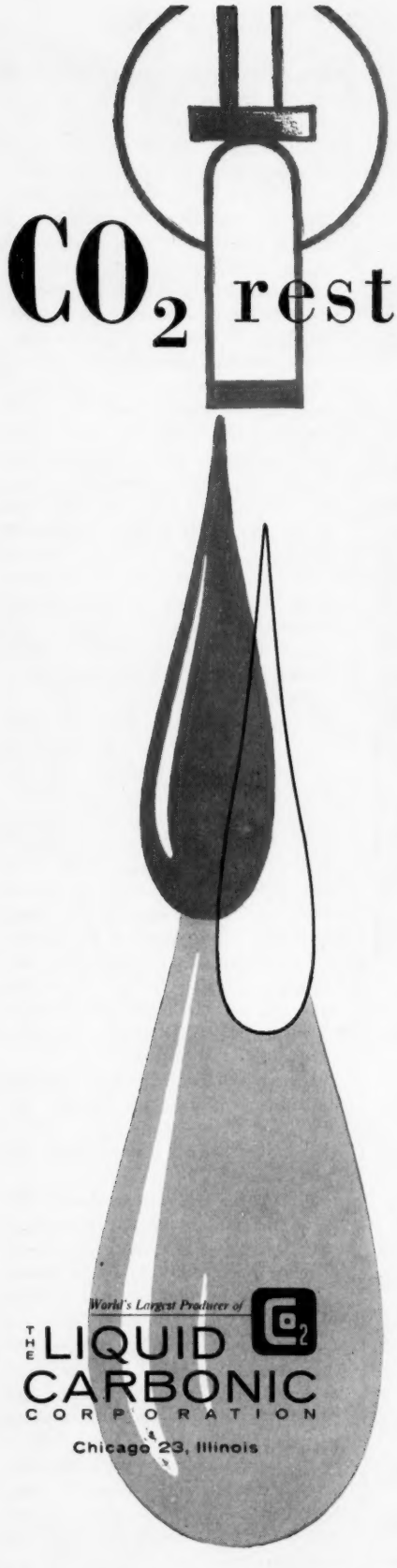
A typical modern fountain pen ink formulation is at least 97% water. In solution with sulfonated dyestuffs (with intense color) are additives to control surface tension (for flow characteristics), pH (which affects corrosion), and "crusting". Most inks contain acid (tannic, gallic, hydrochloric) to improve flow; but, if pH is under 2, there usually are corrosion problems. Permanent inks contain dissolved iron (it leaves an insoluble mark on paper), which must be kept below 1% to avoid sludge formation.

Ball-point ink is also a true solution, but of organic dyes in a glycol media. Dye concentration, however, is much greater than that of ordinary ink, is in the neighborhood of 40-50%. A ball-point ink must be a lubricant, must not corrode iron, and be stable to air (because the pens are not capped).

Although people tend—and are encouraged—to buy the same brand of ink and fountain pen (ostensibly be-

What About Ink?

- The average family buys 60¢ worth of ink a year.
- Blue, in its various shades, is by far the most popular color.
- Contrary to popular belief, sales of red ink do not reflect business conditions, but in fact hold pretty steady year after year.
- The average capacity of ink bottles is 3 oz.; about 13 of these bottles represent $1 of manufacturers' sales.
- Permanent inks, because of their use in business, are slight favorites.
- Stationery stores are the most important ink outlet.
- U.S. firms dominate the international ink market, due largely to the popularity of U.S. fountain pens, which enjoy something of the reputation of Swiss watches.
- U.S. fountain pens are prestige possessions in underdeveloped areas—implication is that the owner is literate.
- Even if kept capped, a modern fountain pen containing a modern ink will dry up if not used for about two months.



WHEN TAPS SLOWED TO A TRICKLE

CO_2 restored the flow

A few years ago the water taps in one of our midwestern cities began to flow too gently. City engineers suspected the culprit was excess lime.

In the lime-soda ash process of water treatment it is customary to over-treat the water to assure maximum softening. This causes plugging of the water lines due to precipitation of the excess lime.

CO_2 SOLVES THE PROBLEM

Recarbonation of the treated water with CO_2 changed the lime to a more soluble form—and water pipes stayed free-flowing. The CO_2 system is successfully solving the lime problem in cities like Minneapolis, Minn., Columbus, Ohio, Eau Claire, Wis. and many other municipalities.

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cause the ink's flow characteristics match the mechanism of the pen), today there is little significant difference between brands of ink. To try to create some difference, Sheaffer has recently added to its Skrip a fluorescent dye that shows check alterations under ultraviolet light. Parker has added a perfume to its Quink.

Penned In: At least two companies have hit upon effective ways to make captive ink customers of purchasers of their fountain pens. Parker's 51 and 21 brands of pen are designed to work best with its Superchrome ink, a fast-flowing, fast-drying ink that doesn't work in other pens (including the new Parker 61). Superchrome is an alkaline ink (Skrip and the others are acid) that dries fast by penetrating the paper, rather than by evaporation.

It has the disadvantage of sometimes (particularly on poor paper) penetrating through to the other side and feathering (i.e., ink lines spread out on the paper). It also costs more: a 3-oz. bottle of Superchrome costs 50¢, whereas a 2-oz. bottle of Quink costs 25¢. Parker says Superchrome accounts for more dollar volume than does Quink; the latter represents a higher unit volume, however.

Another attempt to gain a captive market is Waterman's cartridge fountain pen. This pen obviates one of the most common objections to fountain pens as opposed to ball-points: the messy filling operation. The new Waterman pen (which has just achieved national distribution) takes prefilled polyethylene ink cartridges made only by Waterman. Eight 1.4-cc. cartridges sell for 50¢. Also out with cartridge pens now are Sheaffer and Wearever (David Conn, Inc., North Bergen, N. J.), but cartridges are not interchangeable.

Perhaps such devices, and other filling aids, such as Sheaffer's Snorkel, can revive interest in conventional fountain pens. Many people, of course, still prefer the fountain pen because of its better "feel," its more distinctive line, or because it makes a better gift than does a ball-point. But the inexpensive and nonmessy ball-point pen continues to surge ahead, making its greatest gains among what used to be the big fountain pen ink customers: school children and business houses. Significantly, it is bulk sales of ink that have been hit hardest by the ball-point-trend.

ideas

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NEW HEAVY-DUTY LIQUID DETERGENT FORMULAE --- mixtures of triethanolamine, nonionic surfactants and carboxymethyl cellulose --- have shown better cotton detergency under test than the more usual phosphate-alkylaryl sulfonate liquid mixtures, and have exhibited a washing action equal to that of heavy-duty powders.

Liquids have these advantages over powders: (1) no dust; (2) can be packaged in metal or glass containers which do not become soggy; (3) dissolve readily in hot or cold water; (4) take up less space because of high density.

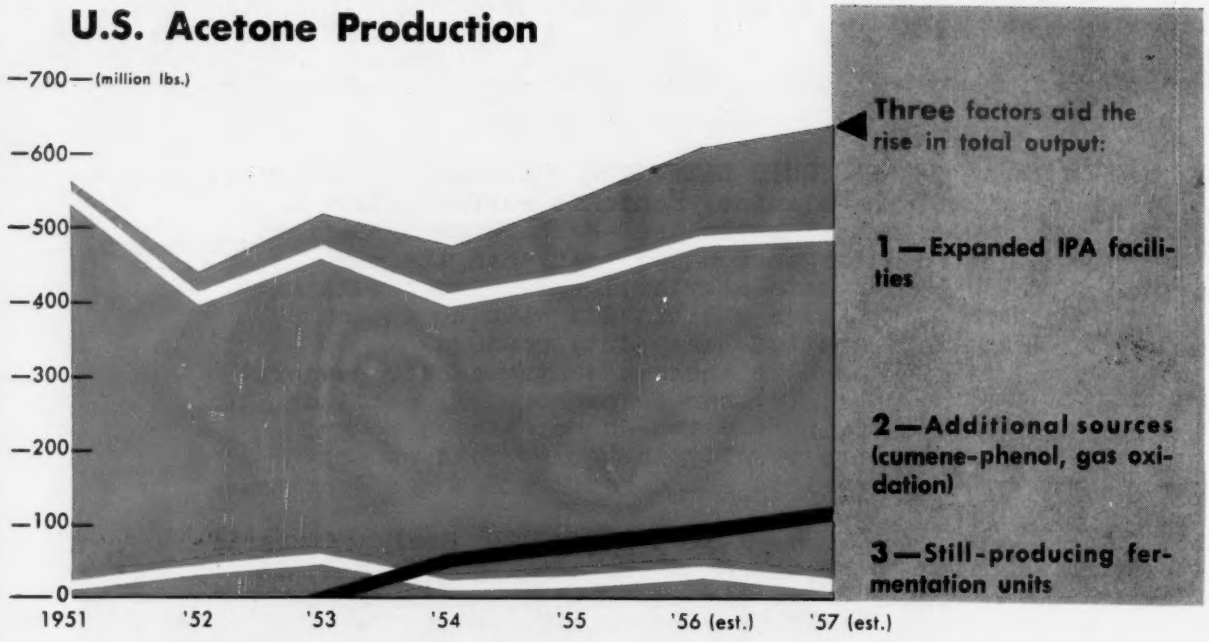
A RECENTLY DEVELOPED INSECT REPELLENT designed specifically to shoo horn flies away from cattle, is reported to contain an ethylene oxide-ortho-cyclohexyl phenol condensation product as the active ingredient.

A DEVICE FOR MINE BLASTING employs nitrogen tetroxide and a hydrocarbon as the explosive mixture. It consists of an unpartitioned container holding frozen nitrogen tetroxide, a separate body of frozen hydrocarbon and a detonator.

A hole is bored in the solid composite and the device is placed inside. The contents of the container are melted, tetroxide mixes with hydrocarbon, and the detonator explodes the mix.

NEW HYDRAULIC FLUIDS take advantage of the stability, solvent properties and desirable temperature characteristics of ethylene glycol.

Formulations include: a magnetic fluid composed of 60-90% iron particles and 10-40% of a liquid hydrocarbon containing up to 5% ethylene glycol; a transmission fluid for automobiles consisting of 50% water and 50% ethylene glycol plus additive traces; a hydraulic pressure-transmitting fluid made up of 5-30%of a poly-ethylene glycol lubricant, 5-30% of a liquid soap and 40-90% of ethylene glycol solvent.



Acetone Outlook Meets Mixed Reactions

Acetone is generating more market hubbub than usual. Producers, consumers and other trade observers are divided in their views on the important solvent's near- and long-term outlook. Conflicting comments range over acetone price, supply/demand, and capacity.

There are, of course, no pinpoint figures available on just how much acetone each of the many U.S. producers can turn out, but agreement in the trade is almost unanimous that total capacity is—and has frequently been—far in excess of that needed to cover the country's requirements.

As recently as 1951, for example, U.S. acetone capacity was approximately 625 million lbs./year, actually 65 million lbs. above production in that year.

This year, the picture is even more out of kilter. Total consumption of acetone during '57 is expected to total some 620 million lbs.—approximately 180 million less than the nearly 800 million lbs. of capacity estimated to be in place by early '58. (Important acetone-yielding routes include isopropyl alcohol (IPA) manufacture, via phenol-cumene processes, natural gas oxidation, and fermentation sources.)

More from Phenol: Latest expansion is at Barrett Division's (Allied) Frankford (Philadelphia) plant. This month, the company is beginning to turn out acetone from recently installed additional equipment that nearly doubles its synthetic phenol capacity.

Barrett is one of the trio of U.S. makers producing phenol-acetone through the cumene route. It reportedly uses a process other than the Hercules Distillers cumene method employed by Hercules Powder and Standard Oil of California.

But cumene-phenol acetone, which made a splash in the trade late in '53 (*CW, Nov. 7, '53, p. 64*), currently accounts for a comparatively small portion of total acetone production—about 10%—although it had been in the commercialization hopper some 15 years before its auspicious introduction.

Although many believed that the phenol-cumene process would open the gates to flooding of the acetone market, events since the process's commercial debut have discounted the earlier glum predictions. Specifically, increasing usage of acetone has satisfactorily absorbed most of the material from this source; the impact on other acetone sources has been nowhere as devastating as had been anticipated.

Phenol-acetone has had some effect in the field, of course, and fermentation-based acetone producers have been perhaps more seriously affected than isopropyl alcohol-acetone makers. Reason: the former must contend with fluctuating price—and supply—of fermentation material.

Until the '30s, most acetone was obtained by fermentation processes; but over the years, this source has dwindled in importance until today it accounts for only slightly more than 6% of total U.S. acetone capacity, less than 5% of U.S. production.

Overshadowing of fermentation as a source became more than noticeable during the mid-'30s when availability of impressive amounts of IPA concomitantly brought about a roof-raising expansion in acetone production.

Acetone Burgeon: Total acetone supply dramatically hop-skipped over the decades: from about 25 million lbs. in 1930 to an eight-fold-higher 202 million lbs. in 1940, to a further hike to 483 million lbs. in '50. More recently, the growth pace has faltered

Estimated 1957 Acetone End-Use Pattern

	million lbs.
Derivative solvents:	
MIBK, MIBC	195
Others (mesityl oxide, di-acetone, hexylene glycol, phorone, isophorone, etc.)	60
Methyl methacrylate	75
Misc. chemicals, drugs, (bisphenol A, chloroform, acetyl acetone, isoprene, etc.)	80
Paint, varnish, lacquer solvent	65
Cellulose acetate solvent	60
Acetylene solvent	30
Misc. solvent, stock changes	50
Export	5
	620

occasionally, but the trend line generally has been upward.

This supply climb will likely continue to be the chief result of increasing production of IPA-acetone. Last year, for example, some 610 million lbs. of acetone were produced in the U.S. from all sources. A shade less than 486 million of that came from IPA. The corresponding figures for '57: an estimated 630 million lbs., of which 495 million will be from IPA.

Bulk of this acetone comes from three producers—Carbide and Carbon, Shell Chemical, and Tennessee Eastman—with the latter accounting for less than 10% of the total IPA-acetone capacity.

Shell recently announced that it would expand isopropyl capacity by 120 million lbs./year. First stage of the program, slated to be completed in '57, will add about 75 million lbs. to the company's capability, and the second 45-million-lbs./year stage will be in '58. Shell's upcoming IPA expansion (which will include new facilities at three of the company's plants—Houston, Tex., Norco, La., and Dominguez, Calif.) doesn't necessarily mean that greater amounts of acetone will pour into the market. But chances are the additions could add some 50 million lbs. or more to present acetone availability.

As noted above, fermentation-based acetone processes have, over the years, been filling a minor role compared with IPA routes. And part of the total capacity-production lag is due to idle fermentation facilities. Carrying the major portion of the current 50-million-lbs./year fermentation-acetone capacity is Publicker Industries, with Commercial Solvents and U.S. Industrial rating second and third.

Direct oxidation of natural gas, as typified by patent-holding Celanese Corp.'s operations, essentially involves propane or butane. The gas is oxidized to yield a mixture of alcohols, organic acids, aldehydes and ketones. About 10% of the output is acetone—now some 35 million lbs./year.

Another acetone producing process, and one that's often been touted as a potential "big timer," is the Fischer-Tropsch process in use only at Hidalgo's Brownsville, Tex., installation. That unit, which is essentially a syn-

Using Salt Efficiently

by **INTERNATIONAL SALT COMPANY, INC.**—America's largest producer of salt

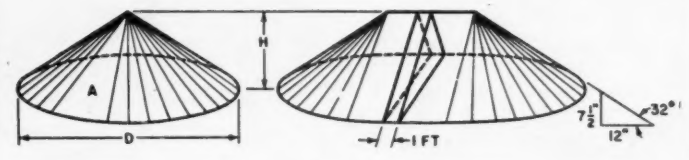
How to Determine Space Needs for Rock Salt Storage

Today, salt-using companies often have the problem of determining how much area and volume are needed to store a given amount of rock salt. To help the companies faced with this situation, International has developed a system for determining the exact floor space (or plant area) needed for any tonnage of salt. In addition, it is possible with this system to select the shape of salt pile best suited to individual plant layouts.

Principles of salt storage. International's system is based on two known facts: first, one cubic foot of rock salt (loosely poured and medium-packed) contains a constant average of 72 lbs. of salt. And, second, every conical pile formed by pouring rock salt from a fixed overhead point assumes the same shape.

Referring to the diagram, you will note that this shape is a perfectly conical one, with an angle of repose of 32° from the horizontal. In other words, for every 12-inch horizontal run, there is a 7½-inch rise. With these basic principles, therefore, it is possible to determine just how large a pile will be formed by any tonnage of rock salt.

Tables give complete area and volume data. For the convenience of salt-using companies, International has prepared a comprehensive set of tables with all the storage-space data for amounts of salt ranging from three to 23,000 tons. With these tables, for example, you can quickly find exactly the amount of space needed to store 3,000 tons of rock salt. (The answer is a single, conical pile 100 ft. in diameter at the base, and 31 ft. high.)



Diagrams of two basic rock-salt-storage piles. Conical at left, windrow at right. Note 32° bevel, which applies to both types.

DATA GIVEN IN INTERNATIONAL'S SALT-STORAGE TABLES

Given any amount of rock salt, from three to 23,000 tons, you can find these storage-pile measurements at a glance:

1. **Height.**
2. **Base Diameter.**
3. **Base Area.**
4. **Surface Area.**
5. **Volume.**

The same data apply to windrow segments. And because each measurement bears a fixed relation to every other, you can find every windrow measurement if you know just one.

In many plants, however, it is not possible to store salt in one large, conical pile. Instead, it must be stored in a lower, longer, windrow-shaped pile. In this case, International's computations on storage-space requirements apply equally well. The data in the tables permit you to select the height or length of windrow pile best suited to your plant needs.

Again taking the example of 3,000 tons of salt: It can be poured from a portable conveyor belt into a pile 65 ft. wide at the base, 20 ft. high, and 100 ft. along the crest. Or, if such a pile doesn't suit your plant needs, the same tonnage can be stored in a pile 75 ft. wide at the base, 23 ft. high, and 55 ft. along the crest.

Easy way to check tonnage of any salt pile. A problem often encountered by salt-using companies is how to determine the amount of salt in a given storage pile. Here again, International's complete tables will quickly give the answer. Because each measurement in a symmetrical salt pile bears a fixed relation to every other, it's possible to find every measurement when only one is known. Thus, a conical pile 16 ft. high will contain 368 tons of salt.

There is still another way in which International's salt-storage tables are helpful. If you want to cover an outdoor pile with tarpaulin or tar paper, you can easily find the surface area of the pile. For example: the surface area of a conical pile 45 ft. in diameter is 1,870 sq. ft. These comprehensive tables are included in a booklet, "Brine for Today's Industry," which will be sent to you at your request. Simply contact International.

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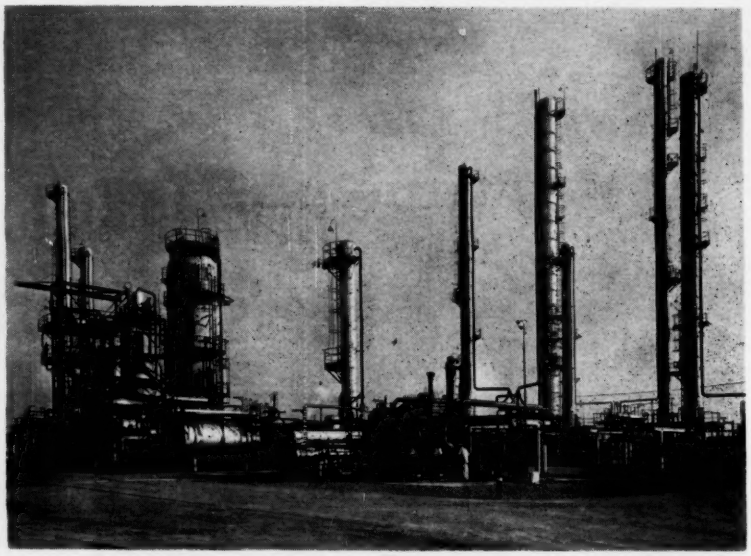


PHENOL-ACETONE plant* contributes to acetone's swelling supply.

thetic fuels plant, can produce a number of by-product chemicals including perhaps 10 million lbs./year of acetone. (It's reported, though, that no acetone is being turned out there at the moment.)

Ready—and Willing: Thus, it's evident that if the acetone industry were truly pressed to meet extraordinary demands, it could produce, within the next couple of years, a staggering 800-850 million lbs./year.

Few marketers will predict that over-all requirements will soon go up to anywhere near that amount, since no new acetone development that could significantly step up consumption is likely to pop up in the next 3 to 5 years.† Acetone price, too, is eliminated as demand-hypo of any great consequence; it has long been considered by producers as being in the bargain-basement range. That, incidentally, is about the only area of agreement, even among top makers, concerning past, present or future status of acetone pricing.

Currently, the material lists at 8¢-lb. (tanks, delivered), and most sellers insist that schedules are firm at that price, will doubtless remain so through the rest of the year. At least one maker envisions a slight price increase, probably for third-quarter business. Others declare there'll be a noticeable shading of quotes this year, if not an actual lowering of official schedules.

Under-the-counter pricing has often been a worrisome feature of the acetone market. Most major producers, of course, have denounced price-cutting tactics, but such moves have often pressured manufacturers' schedules down to unofficial levels.

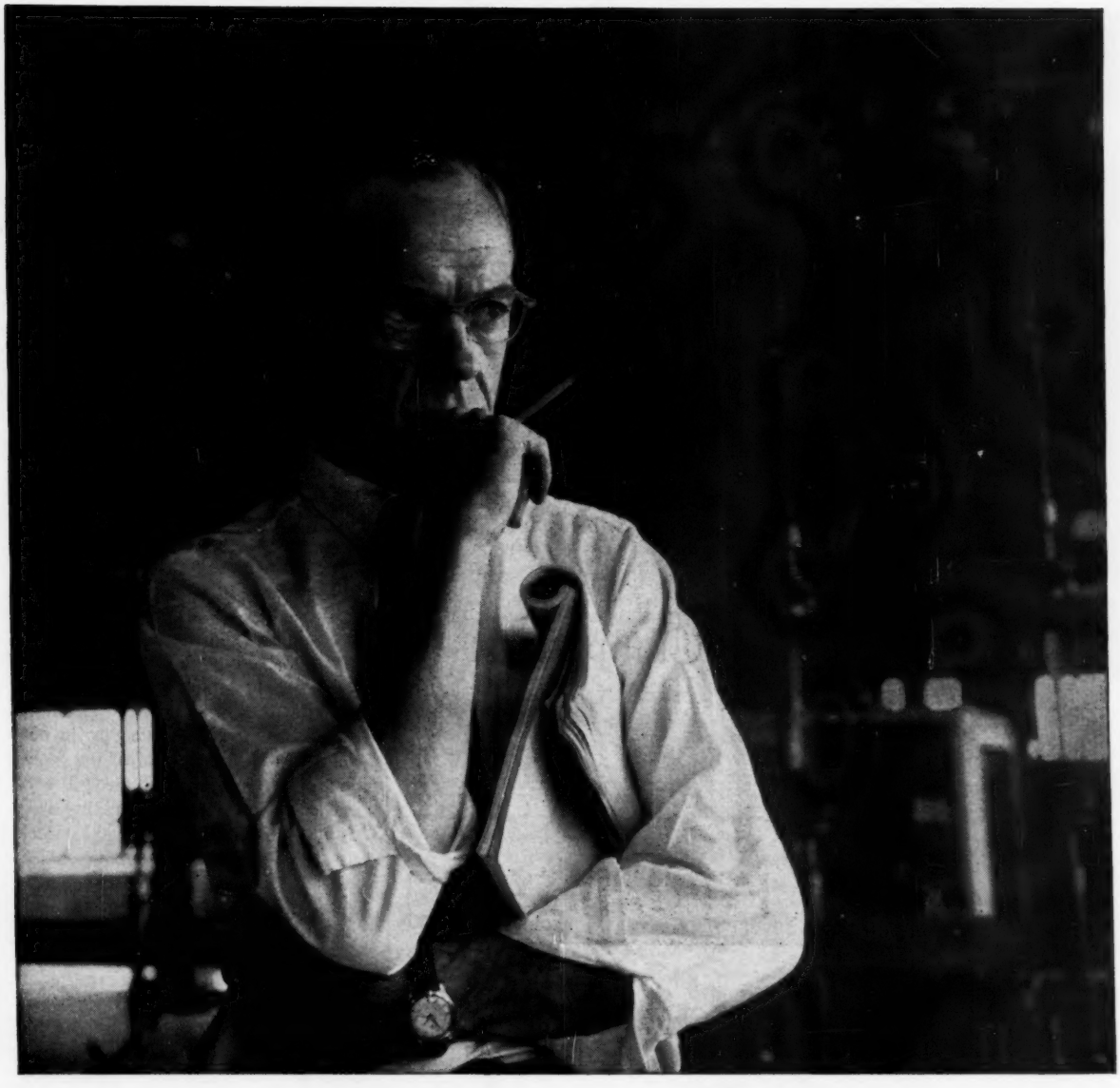
It's uncertain, then, whether acetone prices will soften in the foreseeable future, but one market aspect that could add some starch to the 8¢ price is this: over-all demand for acetone is stronger now than it was a couple of years ago.

How Much to Where? How does this year's estimated 620 million lbs. of acetone demand break down? Which outlets are prime areas for growth? These, and similar questions, understandably spark some varying opinions among trade followers if any but rounded-off estimates are sought. No cause for conflicting statements, though, is the observation that acetone's end-use pattern—since the advent of market-filling synthetic material—has undergone some remarkable changes.

One, of course, was the decline in amount of acetone going into manufacture of cellulose acetate as production of acetic anhydride, particularly via the acetone-ketone route, petered out. This outlet alone has tapered its use of acetone down to about 60 million lbs./year, compared with the

†One possible exception: Air Reduction's planned acetylenic alchols unit (*CW, March 30, p. 21*). Acetone use will initially be small, but the potential is there.

*Oronite Chemical Co. (Richmond, Calif.).



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155-160 million lbs. consumed as recently as '51.

The decline in consumption of acetone as a basis for the anhydride has been accompanied by a similar decline in its use as a cellulose acetate solvent—both due to the steady drop in cellulose acetate production.

Output of acetate (tow, staple and yarn) in '51 came to about 429 million lbs. Estimated '56 production—250 million. The intervening years tallied like this: in '52, 329 million lbs.; '53, 320 million; '54, 265 million lbs. The following year, there was a slight pull-up when output edged up to 288 million. In '56, the downtrend resumed.

There's some belief in the trade, however, that acetate use will increase a modest 5-10% in the next few years in contrast with the over-all decline of the past five years.

Chemical and other solvent uses of acetone, though, have tilted upward steeply in the recent past, and the growth of acetone requirement is expected to continue steadily if not sharply. Take production of the high-boiling solvent, diacetone alcohol, and its derivatives, including methyl isobutyl ketone (MIBK), mesityl oxide, phorones (*see end-use pattern, p. 92*). MIBK (including the amounts converted into methyl isobutyl carbinol or MIBC) may consume some 195 million lbs. of acetone this year as opposed to the 155 million reportedly consumed in the peak-Korean year '51. Add about 60 million lbs. needed for other derivative solvents, and it tallies to a fairly hefty 255-million-lbs. demand for the ketone.

And the outlook? It's not difficult to find opinions in the trade that such acetone needs will grow 20-25% by the early '60s—graphic illustration, indeed, that acetone has come of age as a full-blown chemical raw material.

Although use of acetone as a solvent has not risen as rapidly as its chemical uses, solvents have been—and will be—important siphoners. For instance, consumption of acetone by the acetylene industry is currently figured at about 30 million lbs./year, perhaps 5 million more than it was in '51. Paint, varnish and lacquer outlets will consume an estimated 65 million lbs. in '57, a good 25 million lbs. above '51.

Methacrylate's acetone requirement (for production of acetone cyanhydrin,

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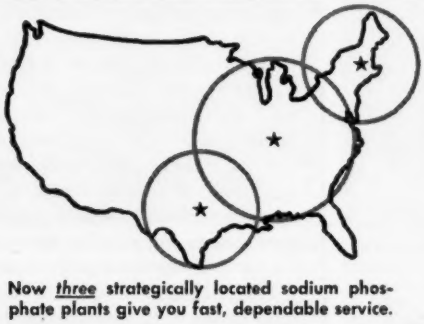

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its precursor) is also slated for increases comparable to those over the last few years. Such acetone need has more than doubled in five years (to a '57 estimate of 75 million lbs.), may climb an additional 10-15 million lbs./year by the turn of the decade.

Uptrend for Epoxies: Epoxy resins, one of the relatively newer acetone consumers (via major component bisphenol-A) is still not a truly significant factor in blotting up acetone, but continued expansions in production and applications will, to some degree, offset the lagging of older, slow-growing outlets.

Epoxies production has undergone a fivefold jump in the last few years (currently, output is in the 35-40-million-lbs./year range), and producers are talking in terms of more than 100 million lbs./year by 1960. (Shell Chemical, for instance, is tripling its epoxies capacity; several other companies plan sizable expansions.)

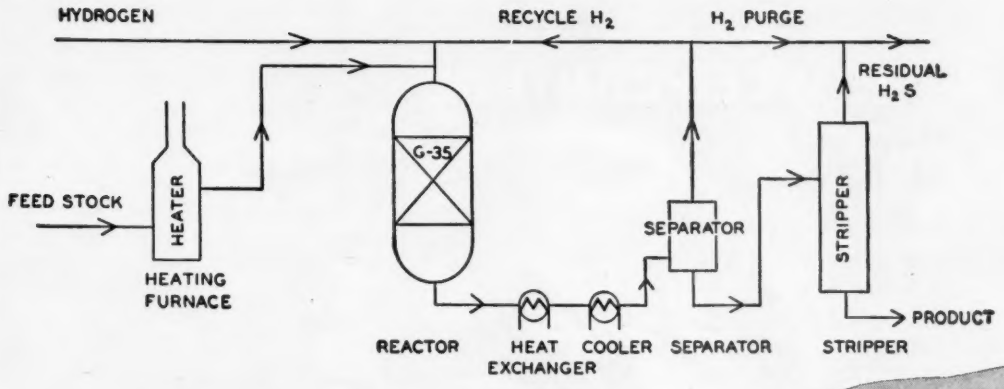
One result of this expansion will, of course, be to up the present usage of acetone in bisphenol-A production from today's estimated 10 million lbs. to as much as 25-30 million lbs./year within four or five years.

Export Slice: Foreign markets at one time were a fairly steady outlet for U.S. acetone, but the picture has undergone some significant changes since post-World War II shipments of 25-35 million lbs./year were common. Exports may again range a little higher than last year's approximately 5.6 million lbs. (though it's doubtful they'll exceed 5 million this year); but by '60, there's a definite chance that growing foreign self-sufficiency in chemical production could slam the door on further imports of U.S. acetone.

Fair, Partly Cloudy: To sum up, then, over-all acetone demand for the next few years appears heartening, even though some outlets are bound to cast a few disconcerting shadows.

Consumption - production - capacity ratio in the U.S. may not at the moment seem within reason, but a longer-range forecast indicates that total acetone requirement—now less than 625 million lbs./year—could reach the billion-pounds/year mark within the next decade or so.

That outlook may inspire general agreement among acetone producers and consumers despite present divergent opinions over some of the ketone's other market aspects.



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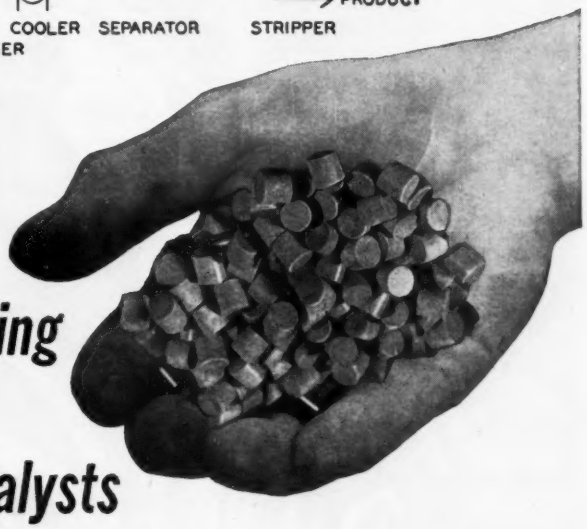

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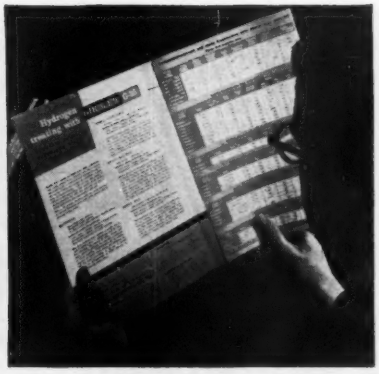

DETAILED INFORMATION is available on G-35 catalysts. Bulletin GC 304 discusses applications, gives process conditions for various distillate stocks, performance features and typical catalyst specifications. Free on request.

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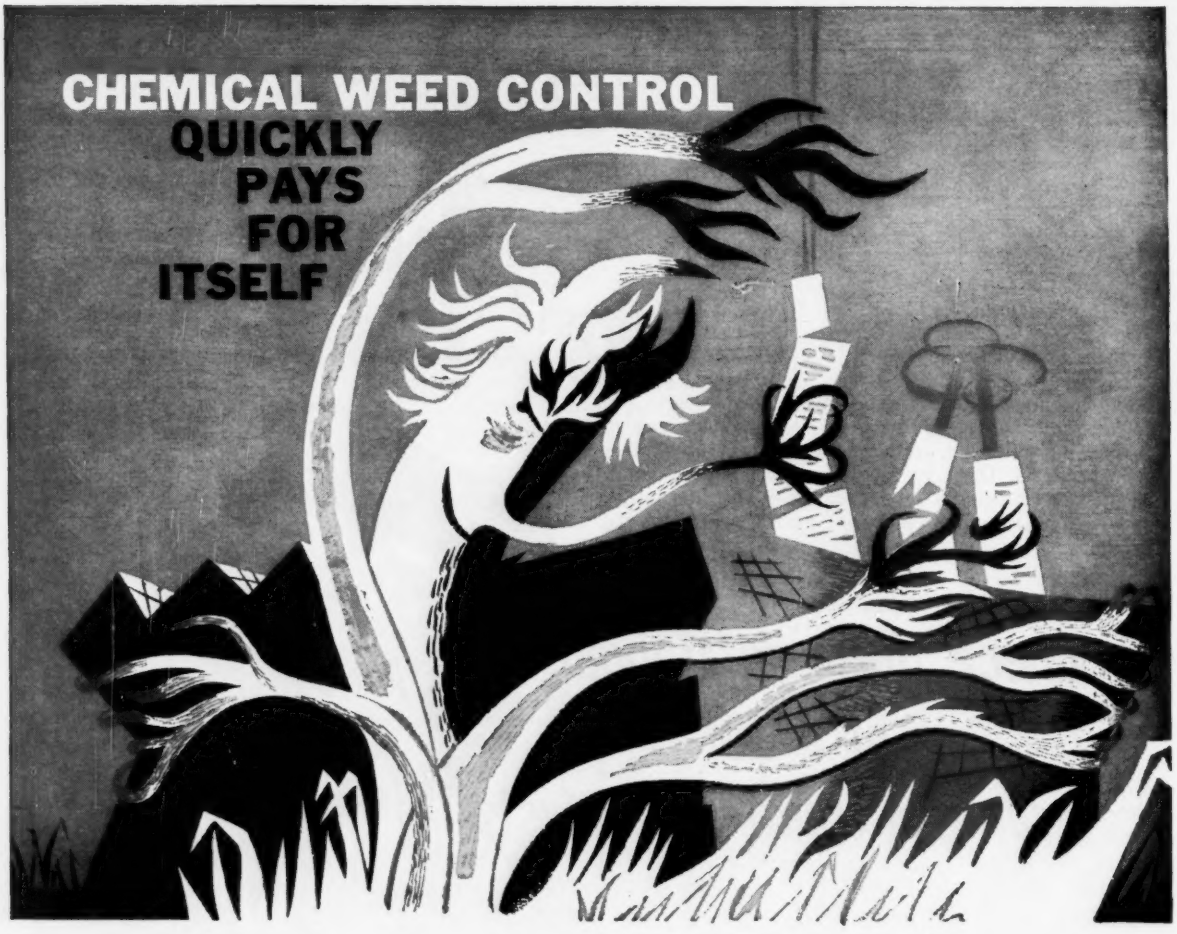

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Market Newsletter

CHEMICAL WEEK
April 13, 1957

Isolated instances of price advances being rescinded shortly after announcement of increases, though perhaps only coincidental, have some market observers convinced that the upward trend of chemical prices is about to level out. A couple of weeks ago, it was toluene that scooted back down to the previous lower quote. Last week, bromine's 1¢/lb. increase (*CW Market Newsletter, Feb. 16*) was canceled.

The higher prices on several chemicals that have been posted over the past several months have been inspired, of course, by manufacturers' attempts to ease out of a profit-pinching squeeze between rising manufacturing, transportation and labor costs and selling prices. These factors, insists one major producer who went along with the bromine backtracking, are still very much in evidence—but so is buyer resistance.

•

Users of hyper-pure silicon are getting a price break, and an upcoming new source of supply. Du Pont is just getting construction under way on a new silicon plant—said to be the world's first full-scale manufacturing facility for the material—at Brevard, N. C. Due date: spring of '58.

And, in a move "designed to give major impetus to the mass production of electronic and solar energy devices," Du Pont is reducing prices and establishing four separate grades on the element.

Price on all silicon aimed at electronic industry use has been pegged at $320/lb. (compared with the $430/lb. price when the material became commercially available about 5 years ago), but last week's move sets these grade prices:

- An entirely new grade (No. 1), which contains the lowest concentration of critical impurities (for power rectifiers and transistors in high-voltage applications), is tagged at $360/lb.
- Grade No. 2 (corresponding to the bulk of the semiconductor silicon used in majority of applications) now sells at $250/lb.
- Another new type, Grade No. 3, for devices used in low-voltage applications, $160/lb.
- Solar cell-grade, which is used in solar batteries for telephone line power, radios, and toys, is reduced $50/lb. to $100.

•

More sodium silicofluoride is hitting the market; Olin Mathieson's new plant at Pasadena, Tex., is now in full production. The company is mum on just how much water fluoridation material can be produced at the new installation, but Vice-President S. L. Nevins reveals that more than $750,000 has been spent in its building.

The new unit adjoins the high-analysis Ammo-Phos fertilizer

plant of the firm's Plant Food Division, recovers fluorides from phosphoric acid manufactured at the location.

Sodium silicofluoride demand isn't as acute as it has been, but it's still rolling along. Production, for example, is expected to check out this year at 30-35,000 tons. Total U. S. capacity by late next year, including Olin's, may reach as high as 50,000 tons/year.

•

U. S. production of styrene took another stride in its march toward the 1.5-billion-lbs./year capacity slated to be in place in the next four years (*CW, March 24, '56, p. 76*). Cosden Petroleum's $3-million, 20-million-lbs./year plant at Big Spring, Tex., came in last week.

Some trade fears that styrene capacity in this country is growing at too fast a rate may well be unfounded. Present—and potential—producers generally seem agreed that demand will continue to keep pace with climbing output. Underscoring the optimism: growth in production of one of styrene's chief outlets, GR-S synthetic rubber. Government figures indicate that in '56, worldwide production and consumption of all types of man-made rubber hit new highs. More than 1.2 million tons were produced (compared with less than 1.1 in '55); consumption totaled 1.14 million tons (contrasted with the previous high of 1.06 million in '55).

Japan continues to raise its sights on world markets. A dispatch from Tokyo notes that the Japanese Trade Ministry has set an export "target" of $150 million worth of chemicals for the 1957-58 fiscal year. Last year, the target was $120 million, although the country actually exported only about $101 million. Reason: fertilizer shipments, which accounted for nearly half the total chemical exports, had to be "restrained" because of increased domestic demand.

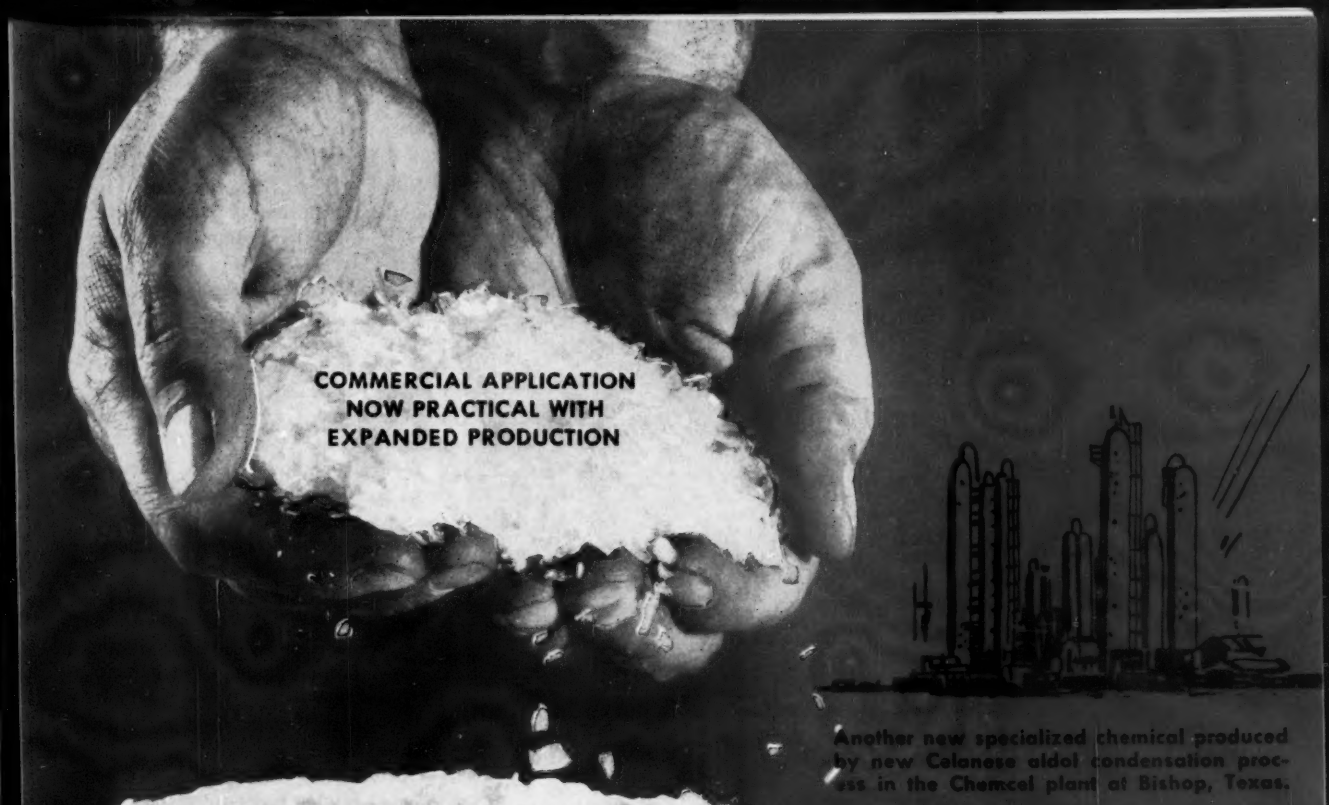
That condition will be changed—fertilizer production in the upcoming year is expected to increase sharply, enough to meet local demands, and to make attainment of the export target certain.

SELECTED PRICE CHANGES—Week Ending April 8, 1957

UP

	Change	New Price
Allyl bromide, 55-lbs., cbys., 5,005 lbs. or more, wks.	$ 0.07	$ 1.47
Methanol, denat. grade, tanks, ftx frt. alld., gal.	0.10	0.85
Methyl chloride, indust., cyls., frt. equald.	0.0075	0.2225
Methylene chloride, tech., dms., c.l., t.l., straight or mixed, wks.	0.0075	0.14
Tallow, inedible, tanks, dlvd., fancy, bleachable	0.00125	0.0775

All prices per pound unless quantity is stated.



Another new specialized chemical produced by new Celanese aldol condensation process in the Chemcel plant at Bishop, Texas.

trimethylolpropane

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Manufacturers of paints and protective coatings can now take full advantage of the better adhesion, color, color retention, hardness and chemical resistance offered by trimethylolpropane alkyds.

Processing of polyurethanes is made easier through the use of this free-flowing, flaked polyol. Formulations containing trimethylolpropane mix more readily with diisocyanates. Its low melting characteristics and low water content are added features of particular importance in polyurethane coating formulations.

Rigid foams produced with polyesters containing trimethylolpropane have higher heat distortion points and are less susceptible to shrinkage. Flexible foams based either on polyethers or polyesters are made tougher through the use of trimethylolpropane.

The properties of this new polyol open the door to the commercial development of other important production applications —synthetic lubricants, plasticizers, surface active agents, polyesters. How will trimethylolpropane fit in your formulations? Write for working samples, prices!

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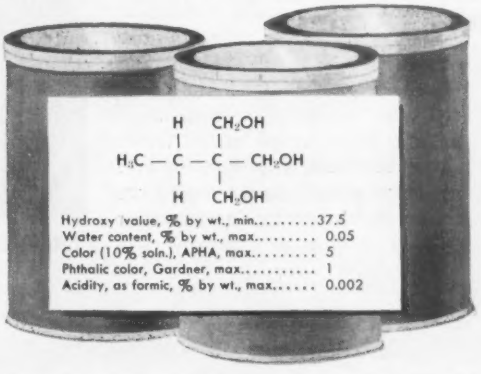

STAFF HUDDLE: For General Electric's chemical development leaders . . .

Development Is a Business

As General Electric's Lexan, polycarbonate plastic (*CW, April 6, p. 96*), barrels along the path to commercial reality, it will get powerful assistance from a development department that's unique in its own right.

Item: GE's chemical development department is organized much like a separate and distinct company.

Item: Aim of the department is to develop a complete "going" business, rather than a product, then turn the business over to the sales organization. In some cases, for example, development staffers are permanently transferred to sales at the switchover.

Item: The development department is charged with responsibility to show profits. (GE even has ways to estimate the profitability).

Item: Development activities are coordinated by a special "product team," which, unlike those in many companies, is formally organized.

GE's development group is not completely different from others; it makes use of many established principles and methods. Yet, the differences are important, have proved useful, for example, in making Irrathene, the firm's irradiated polyethylene, a market contender. Here's how the department operates:

Organization: Set up like a separate business, the chemical development department has its own manager. Reporting to him are the chiefs of four groups:

1—New products development laboratory. It tailors new products for specific uses, studies patent protection, compares products against potential competitive materials, evaluates raw materials and provides technical service during the commercialization stages.

2—Market development unit. This section actually develops field sales, prepares sales and profit forecasts, evaluates competition, impact on other company products and the marketing resources that are needed to sell the material.

3—Process development. Included in its responsibilities are the design of pilot-plant and full-scale production facilities, and the evaluation of process economics.

4—Administration. This section studies financing, calculates the return on investment, and handles employee and plant community relations and other functions.

The product team (one for each product), comprised of a representative of the new products lab, market development and process development, is a vital part of the department's operation. Usually formed when large-scale development begins, these teams serve to integrate the efforts of various development department sections.

In commercializing Irrathene, for example, the team estimated the work and time necessary in each functional area, determined projects that could be carried out sequentially and in parallel. Results: manpower needs were precisely pinpointed, a project

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MARKETING: Field calls build demand.

timetable was prepared, and development work completed faster. The formal organization, regular meetings and team reports avoid "hit or miss" operation and duplication of effort, help systematize coordination.

Marketing considerations bulk large in GE's chemical development. Most of a project's budget is spent on product and market development. Marketing identifies the most desirable business area, the direction of applied research, the prospective customers and the best distribution channels.

Making a Business: Aim of GE's commercialization process is to develop a business as well as the product. Polyethylene sales were transferred to the recently organized insulating materials business only after a sizable market was proved, semiworks production accomplished and significant distribution achieved. During development of Irrathene, a sales force was rented from another group, a technical service organization formed, sales aids and manuals prepared. Even a salesman's newsletter was launched.

The new product is usually turned over to its permanent product department during semiworks production or when the full-scale plant is completed. In Irrathene's case, several key members of the development staff made the switch* too.

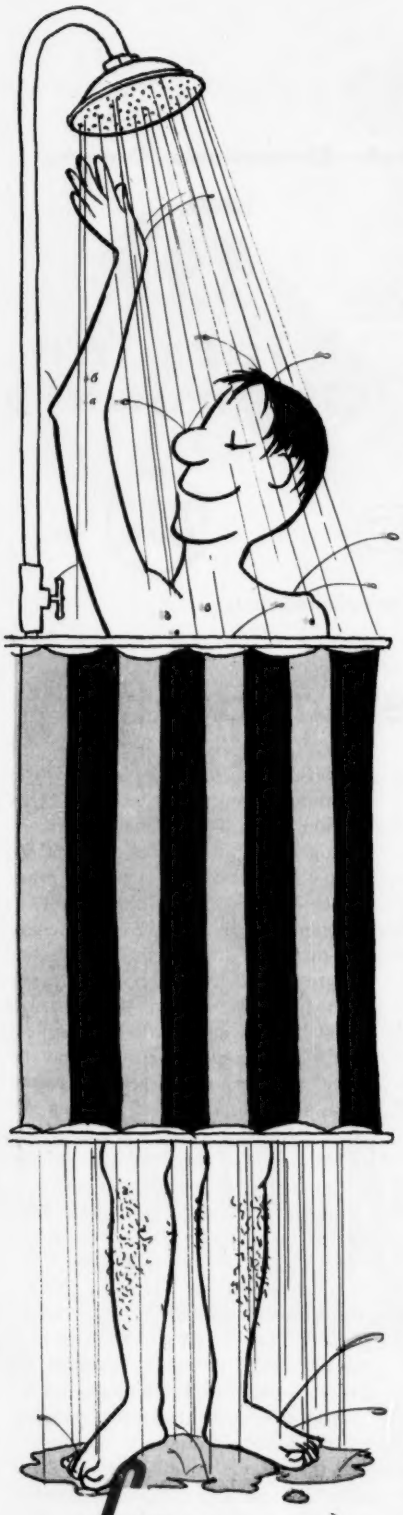
*Transfer of development personnel to product sales depends on the particular situation. In some cases, a transfer is made, in others, not.

Transfer of a business as well as a product, believes GE, has worthwhile advantages:

- Continuity is achieved; customers don't suffer disruptions in product quality and service.
- Commercial development work by salesmen is avoided (sales staffers sometimes lack the time, incentive and technical know-how to do a good development job).
- Both sales and development departments can operate more efficiently. Sales organizations can quickly get into high gear, do not have to divide marketing effort between development and sales. And, by the same token, the development staff isn't straddled with the burdens of sales.

Black Ink: It's not surprising that GE insists that its development department, organized as a business, show a long-term profit. Expenses and investments are compared first against estimated income and, then, against actual return. Profits on the current year's expenses, for instance, are expected within five years. As a rule-of-thumb, a satisfactory profit will be made if, for every development dollar spent, at least $5 of annual sales is reached.

During the coming months, Lexan will pass through much the same stages as did Irrathene—GE is betting that its "development business" will generate still another profitable business.



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NEW EMBLEMS of these chemical companies indicate . . .

Rising Interest in Identity

No less than four large chemical companies—Diamond Alkali, Union Carbide, Hooker and Heyden-Newport—have announced plans to adopt new trademark designs. And, for the most part, the new symbols will be accompanied by thorough redesign of packaging, stationery, literature and other items companies put before the public. The move convincingly underscores chemical producers' fast-growing need for strong corporate identity: the image of the company that customers, consumers, stockholders, the financial community and others carry in mind.

- Diamond Alkali's new emblem is comprised of a diamond figure surrounded by a stylized small "d" that suggests a chemical retort.
- Union Carbide and Carbon Corp., if stockholders approve, will shorten its name to Union Carbide Corp., begin using the words "Union Carbide" in a hexagon. The background color within the hexagon may be changed to represent various company divisions.
- Heyden-Newport is modifying Heyden's trademark to now include the name "Newport" in the familiar benzene ring.
- Hooker is coming out with a logo linking its recently redesigned quadrilateral with the established trademarks of Niagara Alkali, Durez and Oldbury.

What's prodding chemical interest in establishing identity? Basically, it's a desire to get more mileage out of "reputation," the fourth main point of selling. (Traditionally, the chemical industry has concentrated on the other three—price, service and quality.)

Diamond, for example, is launching its program to "suggest character, progressiveness and prestige" for the company. The relative unknownness of chemical firms outside the chemical and allied products industries and the great number of mergers in recent years loom important in spurring the push. Although Union Carbide is one of the country's largest firms, its corporate name, one survey* showed, was unknown to about 35% of consumers, incited no reaction (favorable or unfavorable) in another 34%. That's because, explained a company spokesman, it makes relatively few consumer products; too, its corporate name isn't closely linked to such products as Eveready batteries, Prestone antifreeze.

Hooker believes that recent mergers have caused temporary confusion as to corporate identity, particularly when the merged company becomes part of a surviving corporation. Diamond Alkali adds still another reason: its old trademark was similar to some

*The study was performed before UCC's partial sponsorship of the TV program "Omnibus." Another similar survey will soon be undertaken to measure possible changes in the identification percentages.

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EXECUTIVE DECISION: Top Diamond Alkali management considers final design details of new 'chemical diamond' trademark.

7,000 other registered diamond-shaped symbols.

The reputation that a strong, favorable corporate identity produces helps chemical firms in many ways:

- Recruiting employees. The technical student, for example, is prone to accept a job offer from a well known firm.
- Obtaining financial support. Investment dollars go more readily to corporations whose name is a household word.
- Diversifying into consumer-product lines. Brand identity and reputation build consumer and dealer acceptance quickly.
- Facilitating industrial sales. Salesmen find selling somewhat easier if the buyer is familiar with the company. Reputation is especially important, Heyden-Newport holds, when new products are being offered.
- Distinguishing company from others. Many companies sell identical products or have similar trademarks. Unique identity focuses attention on the firm and its products.

Everyone's Job: In most of the new corporate identity programs, advertising, public relations, sales and even other company departments will play an important role. Advertising and public relations, after selecting* a suitable emblem, will generally promote it through extensive advertising in consumer and business media. Union Carbide, Diamond and Heyden-Newport are currently planning such campaigns. Too, there'll be articles in company house organs and give-aways (ball-point pens, etc.). The new trademarks will also be applied to packaging. Trademark manuals will guide the use and propagation of the new symbols at Diamond and Carbide. Sales departments will add their contribution by personal contact, and via consolidation of sales offices and distribution facilities.

Interestingly, chemical firms aren't planning specific identities for specific publics. But efforts will be made to build corporate image by catering to specific interests. Hooker, for example, may develop financial community interest by calling attention to its financial status and corporate activities designed to strengthen the firm. Union Carbide will use association, display its new symbol in conjunction with recognized product names, such as Prestone.

Not Easy: Most chemical firms report that establishing corporate identity is a difficult and expensive task. Some of the problems:

- Corporate identity will usually help some divisions more than others. Strong executive action is sometimes needed to ensure vigorous company-

*Diamond Alkali evaluated proposed trademarks by four yardsticks: simplicity and strength of design; ability to hold impact when reduced in size; ability to hold impact when used in only one color; character (symbolic representation of the company's business).

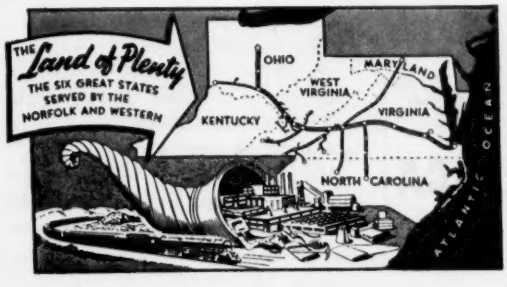
PLAN YOUR NEW PLANT FROM THE GROUND UP!

Finding the plant site is basic groundwork . . . something that should commence simultaneously with the decision to build . . . something that should go forward while other plans are going forward.

If you need a new plant, you're already paying for it. Deciding its size, what materials will be used, how to equip it, who will build it, how you will integrate it with other operations, etc., are all necessary. But if you wait until you've licked other factors to begin looking for a place to build, you're *needlessly* delaying the plant. In fact, the correct answer to many related questions *can't* be reached until you've decided where to build!

YOU HAVE TO GAIN—THERE'S NO WAY TO LOSE!

Since you have at your service without cost or obligation the N&W's team of professional, experienced plant location men, *you can't lose by letting them go to work for you as soon as you decide to build.* They can quickly understand your problems — and they'll go to work for you quickly and quietly. Give them your confidence . . . tell them specifically what you need.



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wide support for a new trademark.

• Sales departments often have special problems because corporate identity also includes distribution methods and markets. One company division, for instance, might be known for price cutting, another for price stability. Too, different corporate sales groups may place different emphasis on distributors. Merger might put a firm into a market where it's competing with its customers, thus acquiring identity as a competitor.

• Physical conversion problems are often staggering. Hundreds of package labels, stationery items, plant signs, etc., must be converted. Union Carbide divisions alone have some 3,500 brochures and technical data sheets. Few firms will attempt mass switchovers on literature and packaging. Old stock will be used, then replaced with the new.

Imposing as the problems are, increasingly more chemical firms are beefing up their corporate identity program, thus promoting enhanced reputation, and easier selling, financing, and labor and technical manpower recruitment.

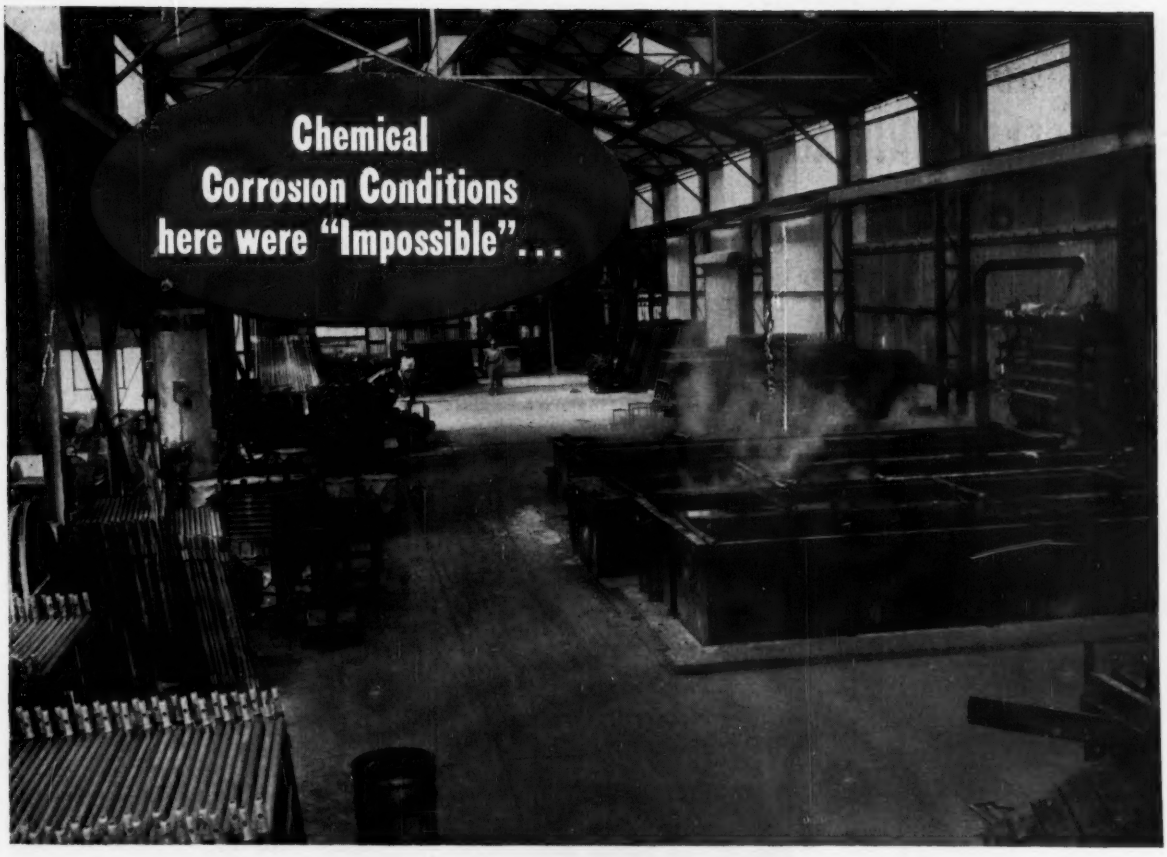
Tanker Plans Nearer

If current proposals materialize, another large chemical tanker will join the oceangoing fleet. Marine Transport Line, Inc. (New York), has requested conditional Maritime Administration approval for a new 18,000-ton vessel to haul liquid chemicals. Approval will let Marine Transport transfer other ships to a foreign flag if it builds the new tanker in the United States.

Right now, the company's plans are quite tentative; the design hasn't been finalized nor has construction begun. And Marine Transport has not yet decided what chemicals the ship should be equipped to handle.

Company spokesmen indicate, however, that the ship's cargo might be similar to that now transported by the *Dow-Chem*—e.g., caustic, glycols, styrene and chlorinated hydrocarbons. Provision for other chemicals may be made if the demand develops. The tanker will cost about $10 million, take about 18 months to build.

Marine Transport is mum on where it intends to operate the vessel. Its tentative size, however, indicates transoceanic or long-haul coastal service.



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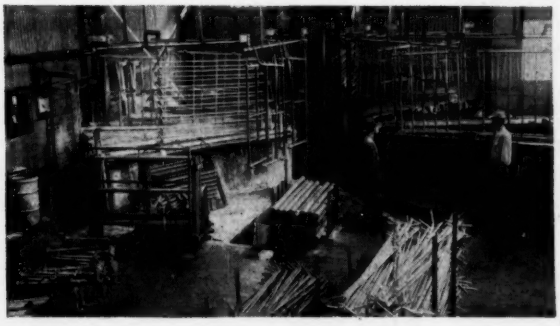

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SALES

Shift for Sales

Expanded sales coverage is the motive for Pitman-Moore's just-announced reorganization of its sales department field management. And the company will soon appoint a director of sales education as the first step toward centralization of sales training.

Pitman-Moore has reorganized into 17 sales districts*, each with a district manager operating under the direct supervision of a regional sales manager. The sales district offices will be located in major market areas of the country.

Historically—P-M's general sales manager, Stewart E. Ruch, told CHEMICAL WEEK—the company has pushed growth in the Midwest and South, avoided sales efforts in metropolitan areas. No salesman, for example, covered the New York City region. Now, however, P-M will have 14 men to serve that territory. The Indianapolis pharmaceutical manufacturer also will station five men in Philadelphia, six in Chicago.

District managers will have authority to make basic decisions in the territory, coordinate promotion and other functions and field-train staff members.

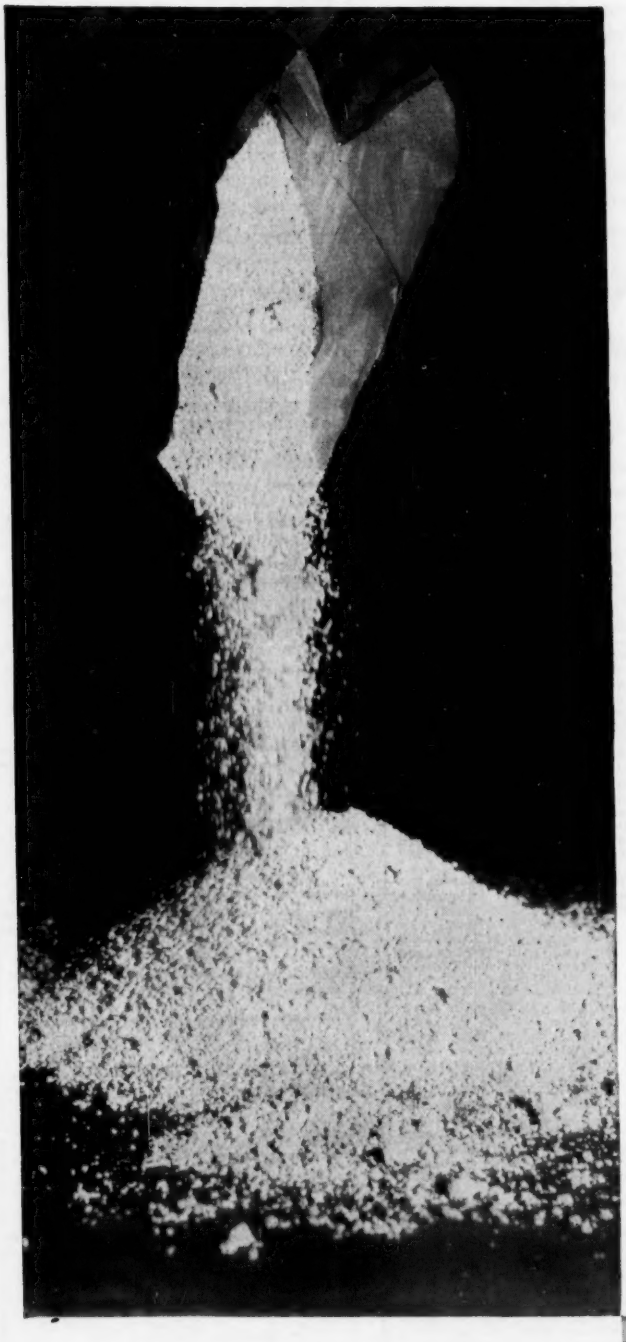
When P-M gets its new sales education director, some sales training will be centralized in the home office. For the past 10 years, training was decentralized as a function of local sales managers. In the future, however, new salesmen will get basic classroom schooling after a six-month stint in the field. That, says Ruch, is because home-office training can best equip salesmen to handle the problems of more competitive selling and "more closely organized markets."

Eventually, the sales-training section will offer refresher and "post-graduate" training for older men, launch a sales manager development program. The new education director will be on the marketing and promotion committees, to aid integration of those efforts into the over-all company program.

For P-M, the shuffle likely portends increased sales. For other drug companies, the move augurs stiffer competition.

*Los Angeles, San Francisco, Seattle, Des Moines, Kansas City, Minneapolis, Indianapolis, Chicago, Detroit, Pittsburgh, New York, Philadelphia, Boston, Charlotte, Jacksonville, Tulsa and Dallas.

Goodrich-Gulf Chemicals, Inc.



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• **Industrial chemicals:** Profusely illustrated 21-p. brochure lists company's chemical products, describes production and distribution facilities, lists technical literature available and addresses of sales offices. Harshaw Chemical Co. (New York).

• **Waxes:** Booklet describes microcrystalline waxes, compares differences between ordinary paraffin waxes and microcrystalline types, gives specifications for hard, emulsifiable and plastic waxes, outlines known applications and delineates the company's production, research and service organizations. Bareco Wax Co. (Kilgore, Tex.).

• **Maintenance chemicals:** Kit contains technical bulletins on wax solvent, cleaners for paint-spray booths, activated soot remover, fuel oil stabilizer and a low-toxicity, nonflammable cleaner for removing greases and oils. Harco Chemical Co. (Cranford, N.J.).

• **Ion exchangers:** Reprint (T-153) of technical paper offers detailed data on the use of anthracite and quartz subfills in demineralizers to reduce rinse requirements. Graver Water Conditioning Co. (New York).

• **Pulp digester:** Bulletin explains and illustrates the construction and operation of the Pandia Chemi-Pulper continuous digester for pulp mills. Black-Clawson Co., Pandia Division, (Hamilton, O.).

• **Alkyl aryl sulfonates:** Booklet gives typical properties, suggested uses and literature references for barium, sodium, ammonium and ethylenediamine dinonyl naphthalene sulfonates. Federal specifications for additives to fuels, lubricating oils and corrosion preventives are included. R. T. Vanderbilt Co. (New York).

• **Moss extractives:** Special technical issue of house organ, *SeaKem Extracts,* describes moss hydrocolloids, applications, and gives instructions for use. Table includes water viscosity and gel strength, milk suspension and gelling strength and emulsion stabilizing data. Seaplant Corp. (New Bedford, Mass.).

• **World trade:** Data yearbook presents, in chart form, U.S. banks with foreign departments, overseas buying agencies located in the U.S., steamship and airline directory, international advertising media, credit trends and other information. Exporters' Digest (New York).

tracers SECTION

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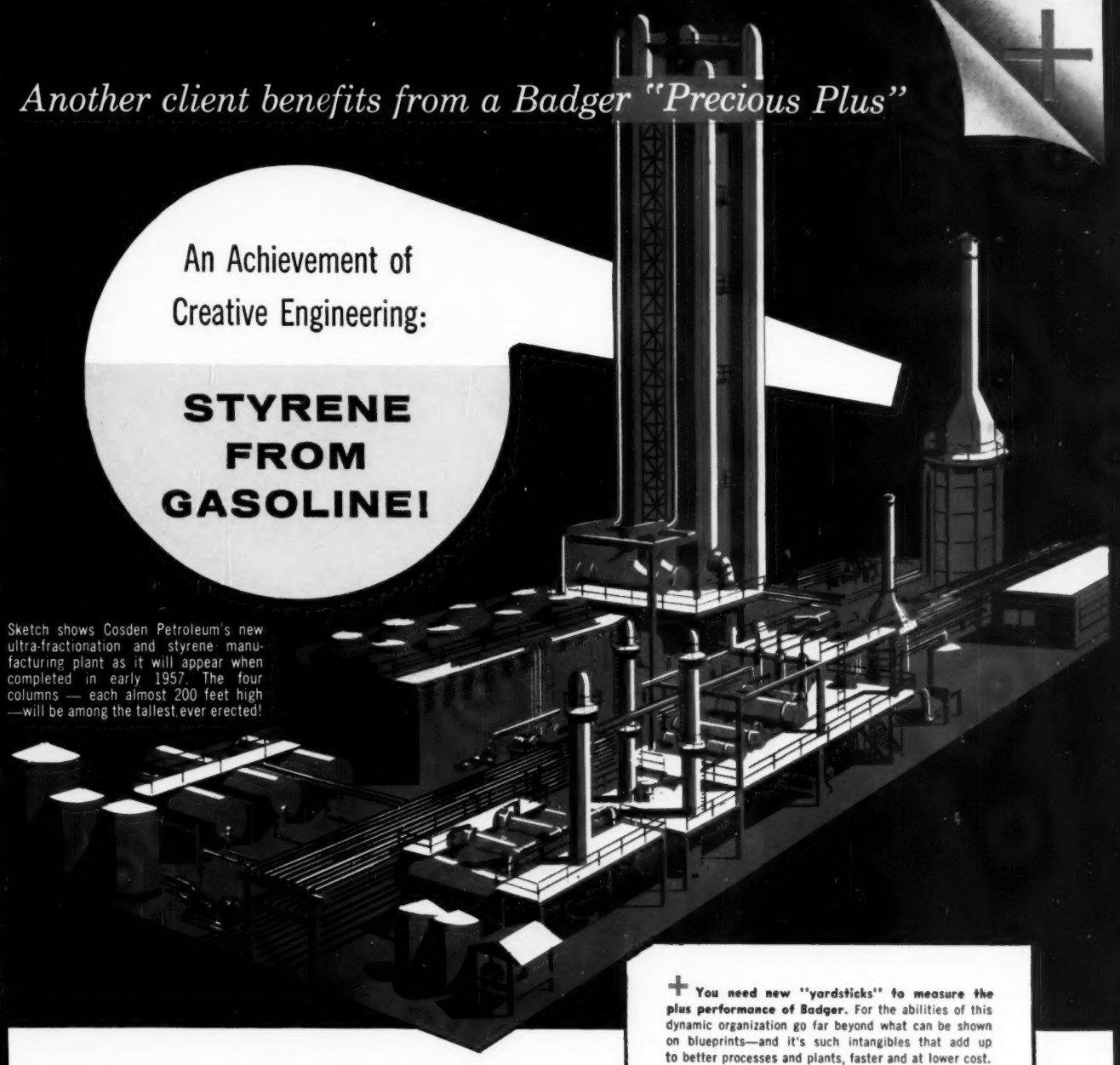

Sketch shows Cosden Petroleum's new ultra-fractionation and styrene manufacturing plant as it will appear when completed in early 1957. The four columns — each almost 200 feet high —will be among the tallest ever erected!

The plant that "couldn't be built" now under construction

At Cosden's Big Spring, Texas, refinery, Badger is erecting the first plant ever designed for the recovery of ethyl benzene by distillation. The process *first* became commercially practical when Badger Engineers developed Ultra-fractionation.

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Other leading companies, too, find Badger's *plus* in performance of precious advantage — whether their need is design, engineering or construction. How else explain the unusual growth Badger is enjoying?

+ You need new "yardsticks" to measure the plus performance of Badger. For the abilities of this dynamic organization go far beyond what can be shown on blueprints—and it's such intangibles that add up to better processes and plants, faster and at lower cost.

*Creative engineering . . . whether your process problem is common or complex, Badger engineers solve it with fresh thinking that frequently produces new efficiencies, unexpected savings.

Broad experience . . . Badger Engineers are more than competent—most staff members are recognized authorities in their fields.

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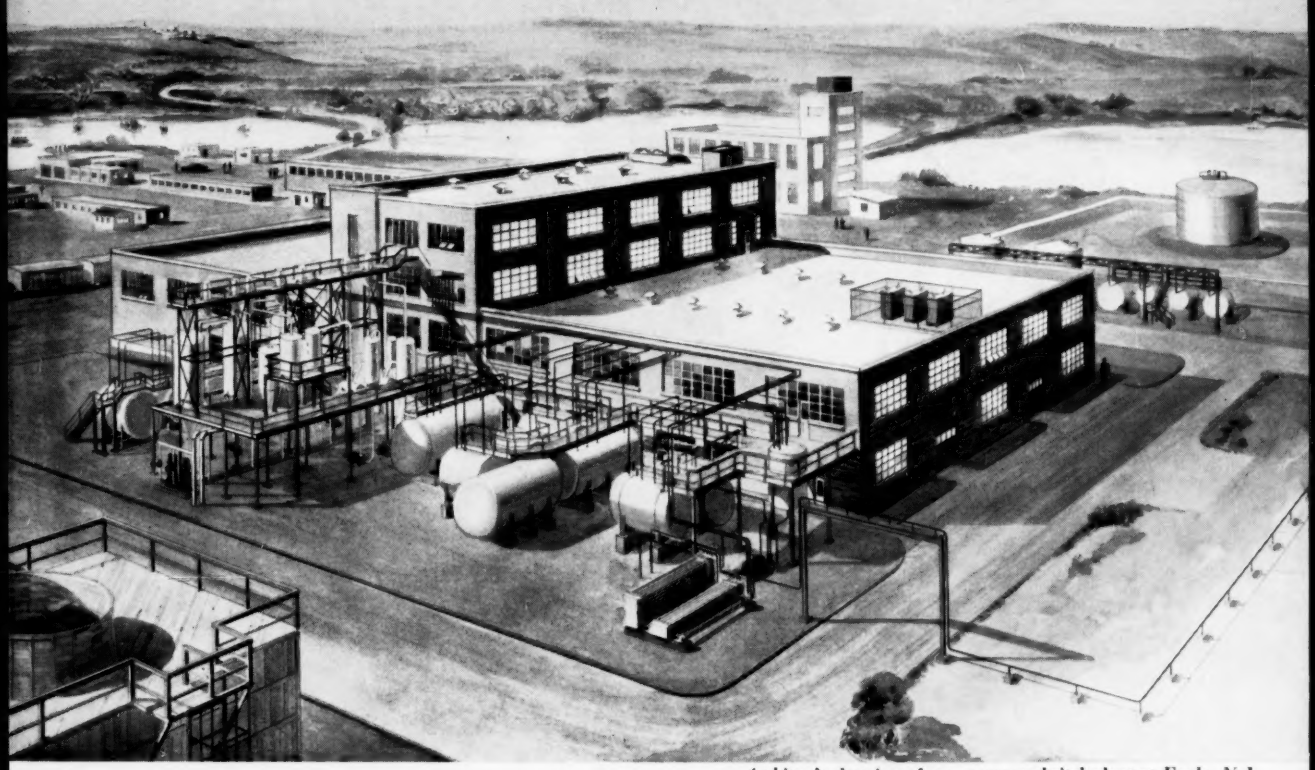

Architect's drawing of new pentaerythritol plant at Fords, N.J.

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A new plant—with an annual capacity of 25,000,000 pounds—will be on stream this summer—turning out Heyden Newport's full line of Pentek® brand pentaerythritols.

This marks the fourth major expansion of its pentaerythritol manufacturing facilities since Heyden developed the first commercial production of Pentek some twenty years ago. It maintains Heyden Newport's position as the world's leading producer of this versatile polyol.

• • •

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